GEM 2025

Generative episodic memory

Interdisciplinary Perspectives from Neuroscience, Psychology and Philosophy

CONFERENCE BOOKLET

June 02.-04.2025

Welcome to Bochum and the Ruhr University for GEM 2025! Following our successful in-person event in 2023, we're delighted to welcome you back to share the latest in memory research. Continuing the GEM tradition of fostering interdisciplinary research, we are excited to foster a vibrant and collaborative environment where researchers from diverse backgrounds can exchange ideas, insights, and findings.

This year's program features five distinguished keynote speakers, alongside 28 contributed talks in two parallel sessions, and two poster sessions. We encourage you to actively participate in the discussions and networking opportunities throughout the event and hope you have a fruitful and enjoyable conference!

The Conference Committee

WELCOME TO GEM 2025

GREETINGS

FROM FOR 2812 "CONSTRUCTING SCENARIOS OF THE PAST"

On behalf of the DFG-funded research unit "Constructing scenarios of the past: A new framework in episodic memory", it is my pleasure to welcome you to this year's event. As our funding comes to an end we would like to take this opportunity to thank everyone who has supported and contributed to our efforts to develop our framework. Our aim at GEM 2025 is to facilitate exchange amongst researchers from diverse disciplines – including psychology, neuroscience, and computational modeling. We are excited to hear about your latest findings, theoretical insights, and methodological innovations. In particular, we are happy to see the continued interest from young and underrepresented scientists and are committed to fostering an inclusive and supportive environment for all attendees. It is my hope that GEM 2025 will be a stimulating and productive event, sparking new collaborations and pushing the boundaries of our understanding of episodic memory. I look forward to engaging with you in lively discussions and fruitful collaborations throughout the conference.

Sen Cheng
Speaker FOR 2812

Talks
Keynotes
Fireside Chat
Poster Sessions
PhD Symposium
Conference Dinner

1 CONFERENCE SCHEDULE

PHD SYMPOSIUM

Monday, June 2nd

08:45 Registration

Session Chair: Marius Boeltzig *Saal 1*

09:00 **Speed Dating**

10:00 Coffee/Tea Break

10:30 **Panel**

Johannes Mahr — York University

Lucia Melloni — Ruhr University Bochum

11:00 **Panel discussion**

MAIN CONFERENCE

Monday, June 2nd

13:00 Registration

Opening Session

Session Chair: Sen Cheng *Saal 2a*

13:30 **Welcome – Martin Paul**
Rector, Ruhr University Bochum

13:40 **Opening remarks– Sen Cheng**
Speaker FOR 2812, Ruhr University Bochum

13:50 **Neil Burgess**
University College London
Generative models of memory (re)construction, consolidation and planning

14:50 **Coffee/Tea Break**

1.1 — Imagination and memory

Session Chair: Julia Taube *Saal 1*

15:15 **Juan F. Álvarez**
Ruhr-Universität Bochum - Université Grenoble Alpes
Memory and imagination: Toward discontinuist simulationism

15:45 **Christine Kindler**
University Hospital Bonn
Reconstructing the past, imagining the future: Network dynamics in memory and imagination

16:15 **Marius Boeltzig**
University of Münster
"I always knew it": Self-serving biases moderate the relationship between future thinking and episodic remembering in the context of elections

1.2 — Memory errors: Perspectives from philosophy and psychology

Session Chair: André Sant'Anna *Saal 2a*

15:15 **Valentina La Corte**
Université de Paris Cité
Temporal distortions and confabulation: Unraveling the neurocognitive mechanisms behind autobiographical false memories

15:45 **Kourken Michaelian**
Université Grenoble Alpes
Philosophical accounts of confabulation: (Why) should empirical memory researchers care?

16:15 **André Sant'Anna**
University of Geneva

Consciousness, metacognition, and the nature of successful remembering and imagining

Poster Session 1

17:00 - 18:30 *Saal 2a*

01 **Carina Zoellner**
Ruhr University Bochum
Investigation of the interaction between semantic information and episodic memory traces in primary school children

02 **Charline Colson**
University of Liège
Temporal compression of real-life events in episodic memory: Predicting compression rates from event features

03 **Madeline Molly Ely**
Bournemouth University
Temporal neural signatures of facial expression and familiarity processing: A cross-dataset EEG study

04 **Marianna Lamprou Kokolaki**
Université Paris-Saclay
Image memorability shapes the temporal structure of memory

05 **Henry Soldan**
Ruhr University Bochum
Neural correlates of the impact of semantic structure on temporal sequence memory

06 **Anna M. A. Wagelmans**
Université Paris-Saclay
Does a shift in mental time translate into a shift in low-frequency oscillations?

07 **Francesco Fanti Rovetta**
Ruhr University Bochum
The self-model in episodic memory construction

09 **Abbie Louisa Greenwood**

University of Glasgow
Do sleep and prediction error affect the directionality of memory associations?

10 **Lydia Moonen**
Radboud University
Does cognitive neuroscience research on mental imagery need behaviour?

11 **Emma Icardi**
University of Trento
Cognitive flexibility: A behavioral and EEG entropy study on the role of open monitoring meditation

12 **Stephanie Michelle Fleming**
University of Glasgow
Stochastic echoes: Variability in phonological recall in bilingual and monolingual speakers

13 **Sophie Siestrup**
University of Münster
Disentangling the unpredicted: Investigating neural consequences of prediction errors on episodic memory traces using Cloned Hidden Markov Models

14 **Dominika Varga**
University of Sussex
Hippocampal prediction errors arise from episodic memories, and not generalised knowledge-based expectations

15 **Valentine Vanootighem**
University of Liège
New Evidence for the Similarity between Believed and Nonbelieved Memories from the Fading Affect Bias

16 **Jay Richardson**
Centre for Philosophy of Memory
Recreativism without heterogeneity

17 **Marion Crump**
Universitätsklinikum Bonn
How do congenitally and late blind people imagine fictitious events?

18 **Lyse Gathoye**

ULiège
Did it happen or not? Memory narratives may hold the answer

19 **Nadja Abdel Kafi**
University Hospital Bonn
Autobiographical memory in congenitally and late blind individuals in comparison to sighted controls

20 **Nina Liedtke**
University of Münster
Initial vs. induced prediction errors: Influences on memory stability

21 **Monika Nemcova**
LMU München
Assessing the preferred route of breathing for modulating neural oscillations during human NREM sleep: A pilot study

22 **Jon Recalde**
Ruhr University Bochum
Unifying episodic memory and spatial coding in a memory-augmented neural network

23 **Arya Gilles**
University of Liège
From spontaneous thought to memory: Factors affecting the recall of mind-wandering episodes

24 **Kevin Nguy**
University of Liège
The impact of context familiarity on spatio-temporal compression in episodic memory

25 **Behnam Ghazinouri**
Ruhr University Bochum
The cost of behavioral flexibility in spatial navigation and spatial learning

27 **Prany Wantzen**
Université Bourgogne Europe
Mental imagery deficits in aphantasia: Effects on autobiographical memory and directive function

28 **Ella Gutenberg**
University of Bonn Medical Center

AMBlind: Resting-state networks of the blind

29 **Emil Eva Rosina**
Ruhr University Bochum
Experientiality markers in memory reports: A semantics-pragmatics puzzle

30 **Antoine Bouyeure**
Ruhr University Bochum
Layer-specific fMRI of the human hippocampus in autobiographical memory

31 **Nicolas Diekmann**
Ruhr University Bochum
Quantifying the learning dynamics of single subjects in a reversal learning task with change point analysis

32 **Lucas Gruaz**
EPFL
A unified benchmark for human-like memory in artificial agents

18:00 **Conference Dinner**
Rote Beete

Tuesday, June 3rd

Keynote

Session Chair: Kristina Liefke *Saal 2a*

09:00 **Johannes Mahr**
York University
A compositional account of episodic simulation

10:00 Coffee/Tea Break

2.1 — Space and Events

Session Chair: Juan F. Álvarez *Saal 1*

10:15 **Jonathan Najenson**
Ruhr University Bochum
Simulation: Spatial, episodic or something in between

10:45 **Sven Krausse**
Forschungszentrum Jülich
Binding semantic, spatial, and temporal information for cognitive mapping and episodic memory

11:15 **Emil Eva Rosina**
Ruhr University Bochum
Mnemic Perspective doesn't matter

11:45 **Zafeirios Fountas**
Huawei Technologies
Episodic memory-augmented LLMs: A generative computational framework bridging AI and human memory processes

2.2 — Retrieval processes

Session Chair: Sophie Siestrup *Saal 2a*

10:15 **Zied Ben Houidi**
Huawei Technologies Co. Ltd.
From sparse cues to complete memories: computational evidence for a biologically plausible model of generative recall

10:45 **Gabriel Zaccaro**
Universidade Federal de Santa Maria
The experience of pastness in autobiographical memory retrieval: A two-level approach

11:15 **Arnaud D'Argembeau**
University of Liège

The role of encoding and retrieval processes in the temporal compression of naturalistic events in episodic memory

11:45 **Markus Werning**
Ruhr University Bochum
Remembering without (representational) memory: A neuro-computational study on regaining categoricity and compositionality from minimal traces

12:15 **Lunch Break**

2.3 — The role of semantic information in episodic memory

Session Chair: Robert Schmidt *Saal 1*

13:45 **Zahra Fayyaz**
Ruhr University Bochum
Attention rules episodic memory

14:15 **Kristina Liefke**
Ruhr University Bochum
Mnemic representations of objects: Accounting for the diverse singular content of episodic thought

14:45 **Jozsef Fiser**
Central European Universty
Emergence, consolidation, and transfer of structured memory in visual implicit learning

15:15 **Pitshaporn Leelaarporn**
University of Bonn Medical Center
Movies of our minds: Patterns of hippocampal subfields during object, scene, and scenario construction

2.4 — Memory Accuracy

Session Chair: Francesca Righetti *Saal 2a*

13:45 **Lucía González Arias**
University of Barcelona
Gluing the past back together: Episodic memory, implicit attitudes, and the Accuracy Framing Problem

14:15 **Gergo Orban**
HUN-REN Wigner Research Centre for Physics
Learning to remember, remember to learn

14:45 **Daria Ford**
University of Mannheim
Priority for Truth! How veracity and importance shape recollection

15:15 **Sofia Pedrini**
Ruhr University Bochum
Mnemic justification and the sense of reality

Poster Session 2

16:00 - 17:30 *Saal 2a*

01 **Marius Boeltzig**
University of Münster
The benefit of being very wrong: Large prediction errors promote distinctive encoding

02 **Dingrong Guo**
Goethe University Frankfurt
Investigating the relationship between schema-based prediction and memory: preliminary findings from a basketball match prediction task

03 **Louisa Warzog**
University of Technology Nuremberg

The Role of Sleep in the Consolidation and Contextual Generalization of Fear Extinction Memories

04 **Lane von Bassewitz**
Osnabrueck University
The effect of dopamine on replay events in a hippocampal spiking network model

05 **Pitshaporn Leelaarporn**
University of Bonn Medical Center
Movies of our minds: Patterns of hippocampal subfields during object, scene, and scenario construction

06 **Julia Taube**
University Hospital Bonn
From single scenes to extended scenarios: the role of the ventromedial prefrontal cortex in the construction of imagery-rich events

07 **Marie Malinowski**
University Hospital Bonn
Neural Correlates of Scene Construction in the Blind

09 **Judith Wenzel**
TU Chemnitz
Are eye movements during sleep linked to memory consolidation? – The first attempt

10 **Mervenur Ayyildiz**
University of Glasgow
Effects of repeated retrieval on memory reconstruction for naturalistic images

11 **Ana Lorena Flores Camacho**
Charité Universitätsmedizin Berlin
Hippocampal beta rhythms in Alzheimer's disease

12 **Anushka Sarkar**
Jawaharlal Nehru Centre for Advanced Scientific Research
Neuronal network navigation on designed patterned substrates

13 **Aya Altamimi**
Ruhr University Bochum

Modelling the effect of audience tuning on generative episodic memory

14 **Magdalena Abel**
University of Technology Nuremberg
Information transmission during collaborative remembering: Majority vote or fine-tuned affair?

15 **Ullrich Wagner**
University of Münster
Audience attitude effects on communicators' memory: The role of the communicator's own initial judgment

16 **Sven Wientjes**
Ghent University
Modeling and manipulating the primacy effect: Evidence for contextual control during free recall

17 **Matthew Watts**
University of Miami
Memory as origami: Constructing episodic recall beyond storage models

18 **Ivan Cotumaccio**
Washington University in St. Louis
Iconic Representations and the Function of Episodic Memory

19 **Jakub Rudnicki**
University of Grenoble
Can a simulationist be a causalist about the metasemantics of episodic remembering?

20 **Maria Ewa Bednarek**
Cardinal Stefan Wyszyński University in Warsaw
Is it too nice to forget? Effect of emotional valence of sources on memory performance in the item-and source-directed forgetting paradigm

21 **Aashritaa Gopalakrishnan**
University College London
Differences in long-term explicit and implicit memory for tone pattern sequences

22 **Lotta Pesonen**

Central European University
Exploring recognition memory for non-semantic visual stimuli

23 **Benedikt Schilling**
University of Technology Nuremberg
A matter of perspective: the focusing illusion in memory processes, future thinking and empathy

24 **Géza Gergely Ambrus**
Bournemouth University
Neural dynamics of facial expression processing: implications for memory formation

25 **Alicja Wicher**
Ruhr University Bochum
Exploring the Neural and Phenomenological Landscapes of Self-Incongruent Autobiographical Memories

27 **Maren Bilzer**
University Bonn
The Impact of Temporal Lobe Epilepsy on Autobiographical memory: reduced specificity and altered spatio-temporal processing

28 **Bastien Durocher**
Université de Liège
Accessibility and availability of actions and spatial displacements in memory for real-world events

29 **Chantal Reinecke**
Universitätsklinikum Bonn
Selective impairment of episodic autobiographical memory in Alzheimer's Disease

30 **Volker Tresp**
LMU Munich
Episodic memories guide behavior

31 **Madeleine Bregulla**
Ruhr University Bochum
Affective touch and face recognition: effects on memory and metacognitive performance

32 **Aude Maier**
EPFL

Evaluating the alignment of computational memory models with human brain activity

Keynote

Session Chair: Markus Werning *Saal 2a*

17:30 **Ali Boyle**
London School of Econonomics and Political Science
Episodic memory in animals: The problem of alternatives

Wednesday, June 4th

Keynote

Session Chair: Roland G. Benoit *Saal 2a*

09:00 **Iris Engelhard**
Utrecht University
Retrieving and modifying traumatic memories

3.1 — Memory malfunctions

Session Chair: Xenia Kobeleva *Saal 1*

10:10 **Adam Manoogian**
Monash University
An active inference model of contextual inference in schizophrenia

10:40 **Francesco Fanti Rovetta**
Ruhr University Bochum
Varieties of self-to-memory dynamics in autobiographical memory: the case of depression

11:10 **Rebecca Dreier**

London School of Economics and Political Science
Are memory errors malfunctions?

3.2 — Remembering collectively

Session Chair: Magdalena Abel *Saal 2a*

10:10 **Nathalia de Ávila**
Universität zu Köln
Memory, anxiety, and the collapse of waiting: How media reshapes collective mental time travel

10:40 **Roland G. Benoit**
University of Colorado Boulder
The schematic scaffolding of past and future episodes: Evidence from human brain lesions and natural language processing

11:10 **Francesca Righetti**
Ruhr University Bochum
Collective remembering and grieving of place disruptions

11:40 **Coffee/Tea Break**

Keynote

Session Chair: Sen Cheng *Saal 2a*

12:10 **Jeremy Manning**
Dartmouth College
How do our memories take shape?

13:10 **Closing Vote of Thanks - Sen Cheng**

FIRESIDE CHAT

Wednesday, June 4th

Session Chair: Aya Altamimi	*Saal 1*

13:30 Lunch

14:30 Panel Discussion

Ali Boyle — London School of Economics and Political Science

Iris Engelhard — Utrecht University

Katja Crone — TU Dortmund University

15:30 Coffee/Tea Break

16:45 **Mapping Resources**

Ali Boyle
Neil Burgess
Iris Engelhard
Johannes Mahr
Jeremy Manning

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KEYNOTE SPEAKERS - BIOS

Ali Boyle

London School of Economics and Political Science

Ali Boyle is a philosopher of science, specializing in comparative cognitive science—the science of nonhuman minds, from animals to artificial agents. She currently holds a UKRI Future Leaders Fellowship at LSE's Centre for Philosophy of Natural and Social Sciences where she focuses on the nature of episodic memory. Dr. Boyle is also involved in the philosophy of biology, where she works on how to count organisms in tricky cases like conjoined twinning, parasitism, and pregnancy. Beyond episodic memory, she has written about self-recognition, self-awareness, and mindreading in animals, and more general methodological issues in animal cognition research. She is especially interested in areas where scientists disagree sharply about nonhuman minds, despite having access to the same evidence.

She received her BA, MPhil, and PhD in Philosophy from the University of Cambridge and is currently an Assistant Professor in Philosophy at the LSE's Department of Philosophy, Logic, and Scientific Method.

PUBLICATIONS:

Boyle, A., Brown, S. A. B., (2025). Why might animals remember? A functional framework for episodic memory research in comparative psychology. *Learn. Behav., 53,14-30.*

Boyle, A., Blomkvist, A. (2024). Elements of episodic memory: Insights from artificial agents. *Philos. Trans. R. Soc. B, Biol. Sci., 79(1913), 20230416.*

Boyle, A. (2022). Do Animals Have Episodic Memory? Current Controversies in Philosophy of Memory. *Current Controversies in Philosophy of Memory (pp. 189-205).*

Neil Burgess

University College London

Neil Burgess is a cognitive neuroscientist known for his influential work on the neural mechanisms underlying spatial and episodic memory. His research integrates neuroimaging, computational modeling, and behavioral experiments to explore how the brain constructs representations of space and time, and how these processes support the formation and recall of episodic memories. A significant part of his work focuses on the hippocampus and entorhinal cortex—structures critical for navigation and memory—which he investigates both in humans and through computational simulations.

Neil received his BSc in Maths and Physics from University College London (UCL) and PhD in Theoretical Physics from the University of Manchester and is currently Professor of Cognitive and Computational Neuroscience at the UCL Institute of Cognitive Neuroscience where he heads the Space and Memory Group.

PUBLICATIONS:

Spens, E., Burgess, N. (2024). A Generative Model of Memory Construction and Consolidation. *Nature Human Behaviour 8, 526–43.*

Bicanski, A., Burgess, N. (2018). A Neural-level Model of Spatial Memory and Imagery. *eLife 7, e33752.*

Burgess, N., Maguire, E. A., O'Keefe, J. (2002). The Human Hippocampus and Spatial and Episodic Memory. *Neuron, 35*(4), 625–641.

Iris Engelhard

Utrecht University

Iris Engelhard is a clinical psychologist specializing in anxiety disorders and PTSD. She is Full Professor of Clinical Psychology at Utrecht University and leads the Experimental Psychopathology Lab. She applies a translational approach to bridge cognitive science and clinical research, improving mental health interventions. Iris works closely with the Altrecht Academic Anxiety Center, is a registered Cognitive Behavioral Therapist (VGCt®) and a licensed Health Care psychologist.

Iris earned her PhD in Psychology from Maastricht University in 2002 and was a Fulbright Scholar at Harvard University. She has received several honors, including the Catharina Pijls Prize and NWO VENI, VIDI, and VICI grants. She has published extensively on fear, memory, and trauma. Iris Engelhard teaches in Utrecht's Clinical Psychology and Research Master SHP programs, as well as in the postdoctoral Health Psychology program at RINO Zuid.

PUBLICATIONS:

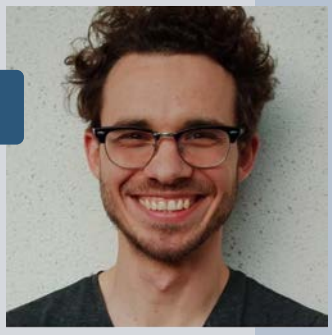
Scheveneels, S., Engelhard, I., & Meyerbröker, K. (2025). Opening the Black Box: The Underlying Working Mechanisms in Virtual-Reality Exposure Therapy for Anxiety Disorders. *Clinical Psychological Science, 13*(2), 207–221.

Endhoven, B., Krypotos, A. M., Mertens, G., & Engelhard, I. M. (2024). No Evidence for Decreased Generalization of Fear Extinction in High-Trait Anxious Individuals. *Journal of Experimental Psychopathology, 15*(3), 12.

Wong, A. H. K., Pittig, A., & Engelhard, I. M. (2024). The generalization of threat beliefs to novel safety stimuli induced by safety behaviors. *Behavioural Brain Research, 470*, 115078.

Johannes Mahr

York University



Johannes Mahr is Assistant Professor in the Department of Philosophy at York University, specializing in the philosophy of cognitive science and memory. His research focuses on the relationship between episodic memory, imagination, and temporal cognition, and he explores how these cognitive processes support social communication and understanding. Prof. Mahr uses both philosophical analysis and experimental methods to study the role of memory in human cognition.

He received a BSc in Psychology from Ludwig Maximilian University of Munich, an MSc in Philosophy from the University of Edinburgh, and a PhD in Cognitive Science from the Central European University. Prior to joining York University, he was a postdoctoral fellow in philosophy and psychology at Harvard University. Johannes's work has been published in journals such as Behavioral and Brain Sciences and Perspectives on Psychological Science. He teaches courses in philosophy and cognitive science at York University.

PUBLICATIONS:

Mahr, J. B. Schacter, D.L. (2023). A language of episodic thought? *Behavioral and Brain Sciences, 46*, e1–e2.

Mahr, J. B. (2019). Thinking about the past for the past's sake: Why did temporal reasoning evolve? *Perspectives on Psychological Science, 15*(4), 1399-1421.

Mahr, J. B. Csibra, G. (2017). Why do we remember? The communicative function of episodic memory. *Behavioral and Brain Sciences, 41*, e35.

Jeremy Manning

Dartmouth College

Jeremy Manning is Professor of Psychological and Brain Sciences at Dartmouth College, specializing in computational cognitive neuroscience. He uses neuroimaging, behavioral experiments, and mathematical models to study learning, memory, and brain network dynamics, with special interests in understanding the dynamics of human thought and in developing personalized learning and teaching tools.

Jeremy earned his PhD in Neuroscience from the University of Pennsylvania and was a postdoctoral fellow in Computer Science and Neuroscience at Princeton University. He has published over 40 manuscripts, along with open courses on learning and memory, computational neuroscience, data science, programming, and experimental methods. His lab has released or contributed to several widely used software packages for data visualization, analysis, and modeling. His work has been supported by grants from the National Science Foundation (including a CAREER award), the National Institutes of Mental Health, the Defense Advanced Research Project Agency, and others.

PUBLICATIONS:

Xu, X., Zhu, Z., Zheng, X., Manning, J. R. (2024) Temporal asymmetries in inferring unobserved past and future events. *Nature Communications, 15, 8502*

Manning, J. R., Owen, L. L. W. (2024). High-level cognition is supported by information rich but compressible brain activity patterns. *Proceedings of the National Academy of Sciences, USA, 121 (35), e2400082121*

Heusser, A. C., Fitzpatrick, P. C., & Manning, J. R. (2021). Geometric models reveal behavioral and neural signatures of transforming experiences into memories. *Nature Human Behaviour, 5, 905–919.*

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Gergo Orban
Sofia Pedrini
Francesca Righetti
Emil Eva Rosina
André Sant'Ann
Markus Werning
Gabriel Zaccaro

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ABSTRACTS - TALKS

Juan F. Álvarez

Ruhr-Universität Bochum - University of Grenoble Alpes

Memory and imagination: Toward discontinuist simulationism

Recent divergent answers to the long-standing question of whether memory and imagination are fundamentally distinct have given rise to the discontinuist-continuist debate, a debate in the philosophy of memory that interacts closely with the sciences of memory (Michaelian, Perrin, and Sant'Anna 2022). According to discontinuism, while memory and imagination may be similar in degree, they differ in kind (Debus 2014; McCarroll 2023; Perrin 2016). Proponents of this view typically endorse the causal theory of memory. According to continuism, while memory and imagination may differ in degree, they do not differ in kind (Addis 2020; De Brigard 2014; Michaelian 2016a). Proponents of this view typically endorse the simulation theory of memory.

A prominent argument advanced by advocates of the simulation theory in favor of continuism appeals to the hypothesis that memory and imagination are underpinned by the same episodic construction system (Addis 2018, 2020; cf. Schacter and Addis 2007). Drawing on research that disputes the existence of such a system and instead posits a specialized episodic memory system (Andonovski, Sutton, and McCarroll 2024; Cheng 2024; Tulving 1983), I argue that the simulation theory of memory should reject continuism in favor of discontinuism.

While some may be skeptical about the very possibility of a discontinuist simulation theory (e.g., Michaelian, Álvarez, and Openshaw 2025), I contend that this theory is worthy of serious consideration because it offers new insights into the causalist-simulationist and continuist-discontinuist debates. Discontinuist simulationism offers a novel perspective on the relationship between memory and imagination and accounts for genuine remembering in terms of the reliability of an episodic memory system that prioritizes first-hand information to simulate events in the personal past, without requiring an appropriate causal connection to past events.

The structure of this talk is as follows. Section 1 challenges the argument that simulationists offer in support of continuism by casting doubt on the explanatory power of positing an episodic construction system responsible for remembering and imagining. Section 2 explores the plausibility of an argument in support of discontinuism that appeals to the existence of a specialized episodic memory. Sec-

tion 3 sketches a discontinuist version of the simulation theory that is compatible with the argument for discontinuism presented in the previous section. Section 4 concludes by responding to two important objections. The first objection questions the "simulationist" status of the sketched discontinuist simulation theory. The second objection attacks the plausibility of the theory and contends that the causal theory is in a better position to make sense of my argument for discontinuism. I respond to the first objection by discussing what "simulationism" should mean. I respond to the second objection by arguing that positing the existence of an episodic memory system is compatible with the simulation theory and does not entail the causal theory of memory.

Zied Ben Houidi

Huawei Technologies Co. Ltd., France

From sparse cues to complete memories: Computational evidence for a biologically plausible model of generative recall

Reinstating details of previously encountered stimuli given a recall cue is fundamental to cognition. Although hippocampus-mediated top-down reactivation of neural ensembles active during encoding is well-documented, the exact neural mechanisms enabling such generative retrieval remain unclear. Notably, recent studies show that large neural ensembles can be reinstated from remarkably few sparse neurons (Carrillo-Reid et al., 2016), a phenomenon not adequately explained by traditional associative models like Hopfield networks.

Recent years have seen an accumulation of overlooked evidence that opens new ways to address this problem. Gap junctions, previously considered limited to development, are now recognized in adult hippocampus and cortex (Nagy et al., 2018) with activity-dependent plasticity modulated by chemical synaptic activity (Pereda, 2014). Significantly, blocking gap junctions disrupts both memory function (Frisch et al., 2005) and memory-related network oscillations (Buhl et al., 2003), suggesting their critical role in ensemble synchronization. Concurrently, backpropagated action potentials have been observed in hippocampal pyramidal neurons and shown to be significantly enhanced by cholinergic signaling (Tsubokawa & Ross, 1997). This cholinergic modulation not only facilitates memory processes but also triggers the very oscillations (Fisahn et al., 1998) that synchronize neural ensembles during memory retrieval.

We propose a synthesis of this convergent evidence into a biologically plausi-

ble hypothesis wherein transient cholinergic modulation initiates memory recall by enhancing backpropagated action potentials from sparse neurons selectively representing cues. These signals propagate through gap junctions along pathways established during encoding, reactivating the original neural ensembles and supported by the synchronized oscillations both systems jointly produce.

We computationally evaluate this mechanism's efficiency through two cue-based retrieval tasks: image-to-category classification and image reconstruction from sparse activations. For classification, we implement a biologically plausible Spiking Neural Network (SNN) with Spike-Timing-Dependent Plasticity (STDP) using the Caltech face/motorbike dataset, ensuring methodological rigor through multiple train/test splits and Gardner-Altman plots. Our method achieves 96.8% accuracy, comparable to support vector machines (SVMs) on many-example learning, and up to 96.2% in one-shot learning scenarios, exceeding SVM performance. For reconstruction, using AlexNet as a computational testbed, we successfully reconstruct detailed images from sparse activations in higher network layers—even using less than 1% of their most active neurons.

This generative recall mechanism bridges sparse coding, exemplified by concept, and distributed neural representations. Our framework explains how sparse cue-responsive neurons in the hippocampus might trigger reactivation of distributed cortical representations through a biologically grounded mechanism that synthesizes previously disconnected observations: (1) gap junctions' unexpected prevalence and involvement in memory, (2) cholinergic modulation of both backpropagation and memory processes, and (3) the role of neural oscillations in coordinating ensemble activity during memory retrieval.

If experimentally validated, this mechanism could represent a paradigm shift in our understanding of generative cognition, illuminating processes from mental imagery to language comprehension.

References:

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Carrillo-Reid et al. Science (2016)
Fisahn et al. Nature (1998)
Frisch et al. Behavioural Brain Research (2005)
Nagy et al. Biochimica et Biophysica Acta (2018)
Pereda, Nature Reviews Neuroscience (2014)
Quiroga, et al. Nature Reviews Neuroscience (2012)
Tsubokawa et al. Journal of Neuroscience (1997)

Roland G. Benoit

University of Colorado Boulder, USA

The schematic scaffolding of past and future episodes: Evidence from human brain lesions and natural language processing

This presentation tests the hypothesis that the medial prefrontal cortex (mPFC) critically supports the recollection of past episodes and the simulation of future episodes - specifically by mediating the reinstatement of memory schemas. Memory schemas provide general knowledge about what to expect in a given scenario (e.g., the sequence of events when preparing a meal). Such general knowledge is thought to scaffold the (re)construction of specific episodes. One methodological challenge in elucidating the contribution of the mPFC to schema reinstatement is the difficulty in assessing the schematic content of recollected and simulated episodes. Here, we first used natural language processing on data from an online sample ($n = 600$) to infer the schematic content of several everyday scenarios (e.g., preparing a new meal; in a bakery; on a picnic). Specifically, using topic-modelling, we determined the key reoccurring content across a large number of reported memories and simulations. We take the ensuing topic words and the average embeddings of the narratives to reflect the normative schematic content of a given scenario. We then examined whether people with mPFC lesions ($n = 17$) use that schematic content less than matched controls ($n = 34$). A traditional measure of autobiographical recall (i.e., the Autobiographical Interview) revealed that lesions to the mPFC caused impoverished recollections and simulations that were characterized by a diminished number of episodic details. Natural language processing indicated that this was– at least partly – due to a reduced reliance on schematic knowledge that otherwise seems to help scaffolding retrieval and simulation. Specifically, narratives of people with mPFC lesions entail less of the schematic topic words, and their embeddings deviate more strongly from the embedding of the respective normative schema. Notably, as expected, the deficiency in using schematic content was particularly pronounced for future simulations. This is consistent with a stronger scaffolding demand for the simulation of novel episodes. Together, the data provide evidence for the critical contribution of the mPFC to the reinstatement of memory schemas.

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"I always knew it": Self-serving biases moderate the relationship between future thinking and episodic remembering in the context of elections

The processes of imagining the future and remembering the past are two strongly related processes. Both are generative and constructive, meaning that they can be impacted by self-serving biases, goals, and current beliefs. This has been shown for remembering, but not for future thinking. Additionally, while many studies compare future thinking with episodic remembering, few do so longitudinally with one specific event, making conclusions about phenomenological similarities difficult. To test the congruence between future thinking and episodic remembering and assess their vulnerability to self-serving biases, three longitudinal studies were conducted where participants imagined the outcome of upcoming elections (EU election in Germany, UK general election, US presidential election) before they happened and remembered them afterwards. It was found that remembering was perceived as more vivid than imagining, and that the valence of the event was in line with participants' political views. Furthermore, there was evidence for a self-serving bias as participants retrospectively judged elections where their preferred party lost as less important than they had indicated before the election. After the US election, participants were also asked to remember the predictions they made before the vote. This measure showed strong bias, with participants shifting their ratings towards their current beliefs and away from their actual predictions. For instance, Republicans judged the elections as considerably fairer afterwards than they had predicted before, while the opposite was true for Democrats. Crucially, both groups shifted the memory of their predictions towards their current perception of election fairness. The results help to understand similarities between future thinking and episodic remembering, within the special context of elections, and show that self-serving biases can moderate their relationship.

Ali Boyle

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Episodic memory in animals: The problem of alternatives

Determining whether animals have episodic memory requires weighing the hypothesis that they do against salient alternative hypotheses. However, in research on episodic memory in animals, such alternative hypotheses are rarely spelled out in the detail required for this kind of evaluation (Boyle & Brown, 2025). In this talk, I consider some salient alternatives – including semantic memory, episodic-like memory, and event memory – and attempt to fill in the details. In each case, I argue that it is either unclear what the hypothesis amounts to, that it does not explain the evidence as well as the episodic memory hypothesis, or that it fails to present a genuine alternative to the episodic memory hypothesis because the memory capacity appealed to is either entangled with or a variant of episodic memory. Whilst there are doubtless alternative hypotheses available that I don't consider, I suggest that this strengthens the case for episodic memory in animals: sceptics about episodic memory in animals owe us a detailed hypothesis about what memory capacities animals have, if they lack episodic memory.

Neil Burgess

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Generative models of memory (re)construction, consolidation and planning

Episodic memories are (re)constructed, combining unique features with familiar schemas, share neural substrates with spatial navigation and imagination, and show schema-based distortions that increase with consolidation. Here I present computational models (with Eleanor Spens) in which hippocampal replay trains generative models in neocortex to (re)create sensory experiences via latent variable representations in entorhinal, medial prefrontal, and anterolateral temporal cortices. Simulations show effects of memory age and hippocampal lesions in memory for scenes, in agreement with previous "complementary learning systems" or "multiple trace theory" models, and also provide mechanisms for semantic memory, imagination and schema-based distortions. The model explains how unique sensory and predictable conceptual or schematic elements of memories are stored and

reconstructed by efficiently combining both hippocampal and neocortical systems, optimising the use of limited hippocampal storage for new and unusual information. Simulations aimed at encoding sequential information additionally account for gist or schema-based distortions in memories of narratives, and show how recent memory and consolidated information can contribute to structural inference and planning.

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The role of encoding and retrieval processes in the temporal compression of naturalistic events in episodic memory

Why does remembering an event take less time than experiencing it? Recent evidence suggests that episodic memories temporally compress the unfolding of events, summarizing them into a sequence of discrete experience units that represent some segments of prior experience while omitting other segments. In this talk, I will discuss how encoding and retrieval processes shape this temporal structure of episodic memories. To examine the role of encoding, we investigated the interplay between attentional resources and the segmental structure of events. Participants watched a series of videos containing many or few event boundaries while simultaneously performing a concurrent task during half of the videos. After each video, they mentally replayed and then verbally described the events. Results showed that videos with more event boundaries led to a greater number of recalled experience units and a lower temporal compression rate. However, when attention was divided during encoding, fewer experience units were recalled, particularly for videos rich in event boundaries. These results suggest that attention to the segmental structure of events determines the encoding of experience units in episodic memory, thereby modulating the rate of event compression. In other studies, we investigated the contribution of retrieval processes by assessing recognition memory performance for recalled versus omitted event segments during the mental replay of real-world events. Participants experienced a series of events during a walk on a university campus, which were recorded using eye-tracking glasses. Then, they freely recalled the events and completed a recognition task, distinguishing between video clips from their own walk and those from other participants. Recognition accuracy was lower for omitted segments than for recalled ones, yet still above chance. This suggests that omissions during recall stem from

both encoding and retrieval processes: while some segments are lost due to selective encoding, others remain available in memory despite being omitted during mental replay. Taken together, these findings highlight the joint contribution of encoding and retrieval processes in shaping the compressed temporal structure of events in episodic memory.

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Memory, anxiety, and the collapse of waiting: How media reshapes collective mental time travel

This paper argues that the structure of collective memory and future anticipation is hijacked by media-driven immediacy, which leads to chronic anxiety, reactionary decision-making, and the erosion of patient, reflective engagement with time. It thus reconciles two contrasting perspectives: cognitive science and phenomenology. In cognitive science, Collective Mental Time Travel (CMTT) refers to the ability of groups or societies to mentally project themselves into the past or future while simulating events collectively rather than individually. It is an extension of the concept of mental time travel (MTT), which describes how individuals recall past experiences (episodic memory) and imagine future scenarios (episodic future thinking). Anxiety in this context impairs memory's linear function, which leads to measurable disruptions in processes like episodic recall and future-oriented thinking. In contrast, phenomenology approaches anxiety as a fundamental mode of existence that changes the human relationship with time, selfhood, and the world . It situates memory within a temporal and existential framework through the integration of lived experience. The cognitive and phenomenological perspectives diverge significantly in their assumptions. Cognitive science adopts a linear and functional model of temporality, focusing on memory's discrete roles in navigating past, present, and future. Phenomenology, however, admits a fluid, interwoven temporality, where anxiety collapses distinctions between these dimensions and redefines memory as an existential engagement with time. The paper argues that these divergent frameworks should be reconciled to construct a more comprehensive model of understanding media's influence on collective mental time travel in order to understand 1) what is anxiety as a collective phenomenon and b) the effects of media in its constitution. Specifically, it shows how media fuels CMTT by accelerating the mind's movement between past

and future, which creates a temporal dislocation that closely resembles what phenomenology defines as anxiety (Angst). Media intensifies this existential condition by collapsing temporal distance and thus individuals and societies to inhabit preemptive realities—disasters, crises, and collapses that have not yet occurred but are already emotionally experienced as inevitable. The result is a phenomenological thinning of the present, where people do not simply recall the past or anticipate the future but become existentially trapped in an as-if temporality—constantly responding to futures that may never arrive yet shape real-world emotions, policies, and social behaviors. In this way, the media constructs a permanent state of ontological anxiety, wherein we are always already living in the catastrophe before it happens.

Integrating cognitive science and phenomenology is not just beneficial but essential for grasping the nature of contemporary psychopathology. In a world perpetually on edge—where catastrophizing has become the norm and society has forgotten how to wait—our understanding of mental distress cannot remain fragmented. Cognitive science provides the empirical rigor necessary for evidence-based discourse, while phenomenology offers an irreplaceable first-person account of lived anxiety. Without bridging these fields, we risk clinging to an outdated paradigm that isolates disciplines, reduces cognition to mere brain function, and neglects subjects-world interaction. Only through this synthesis can we develop a framework that truly reflects the complexities of our present condition.

Rebecca Dreier

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Are memory errors malfunctions?

Episodic memories can fail to represent the past: We often forget, misremember, or make up histories we have never experienced. Still, the Mnemonic Function View (MFV) takes it that episodic memory evolved for encoding, storing, and retrieving tolerably accurate representations of the past to use in retroactive and unrestricted learning (Boyle 2019, 2022; Brown 2024; Schwartz 2020). This seems to suggest that episodic memory malfunctions regularly, with every memory error (De Brigard 2014). However, especially minor memory errors are not necessarily malfunctions. If only minor or unimportant details are misrepresented, then the conditions of tolerable accuracy can still be met (Schwartz 2020). In this paper, I argue that even more severe memory errors need not constitute malfunctions. I

present a strategy to evaluate whether memory errors are malfunctions or should instead be understood in terms of various alternatives to malfunction.

Not every case in which a trait fails to perform its function is a malfunction (Millikan 1994, 2017). Some are "mere failures to perform" (Sullivan-Bissett 2024:4). Mere failures to perform are ways a trait fails to perform its function while nevertheless operating as normal. Therefore, to establish whether a given memory error constitutes a malfunction, we first need to ask whether the underlying processes are operating as normal. In the case of episodic memory, we need to ask whether a particular memory error has been produced by typical episodic memory processes.

Depending on whether this condition is met, we have various options for understanding memory errors. There can be other goals interfering with episodic memory operating normally. For example, a memory error can constitute a trade-off when another function of episodic memory or another trait, is executed to increase fitness. However, a memory error might also be produced to protect episodic memory's mnemonic function. Thus, although the specific memory is misrepresenting the past, it acts as a shear pin to uphold one's general ability to form accurate episodic memories. On the other hand, if typical episodic memory processes are operating normally, the failure to perform may be explained by an unsupportive environment. An environment can be unsupportive in two ways: (1) it may have changed since episodic memory was selected for, making the memory error a "misfunction" (Sullivan-Bissett 2024); or, (2) a memory error constitutes a by-product, that is, episodic memory has features that lead to failures to perform in particular situations and environments. However, these features developed during the selection for episodic memory without influencing its selection. Only if a misrepresentation fits with neither of those explanations, can we classify the memory error as a malfunction.

This strategy provides a clear way to determine whether a memory error constitutes a malfunction. I exemplify its usefulness by applying it to several memory errors, showing that even in the most severe cases of memory error, episodic memory does not always malfunction – it merely fails to perform.

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Varieties of self-to-memory dynamics in autobiographical memory: The case of depression

Autobiographical memory and the self are closely connected. Autobiographical memories provide the information to form and maintain a stable self-model (memory-to-self dynamics). The self, in turn, modulates the construction of autobiographical memories during retrieval (self-to-memory dynamics). Past research has mainly focused on the former direction of influence (Boyle, 2019; Habermas, 2011). However, self-to-memory dynamics are being increasingly investigated (Dings & Newen, 2023). We contribute to this line of research in two ways.

First, we introduce the self-memory system framework (Conway et al., 2019; Conway & Pleydell-Pearce, 2000), with an emphasis on self-related processes involved in autobiographical memory retrieval. Specifically, we address certain theoretical ambiguities in the framework's depiction of self-related concepts and propose a revised version. In particular, we differentiate between the long-term and situationally activated aspects of the self, as well as between its representational components (incl. conceptual and narrative elements) and agentive (i.e., executive control) processes.

Second, we present a general framework for understanding self-to-memory dynamics in major depressive disorder, expanding on previous research on self-related mnemonic biases both in neurotypical and non-neurotypical individuals (Schacter et al., 2023; Finch et al., 2023). We introduce four dimensions of the self that are relevant in autobiographical memory construction: self-coherence; self-valence; self-knowledge; and self-control. Based on the characteristics of the self in depression, we propose an outline of the self-to-memory dynamics in depressed individuals along these four dimensions, in light of existing empirical evidence. Additionally, we suggest that our framework, with appropriate adjustments, may also be applicable to self-to-memory dynamics in other mental health conditions.

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Attention rules episodic memory

Attention is fundamental to cognition, enabling the brain to prioritize relevant information and filter out extraneous details. This selective focus is essential for managing sensory input and supports higher-order functions like decision-making, learning, and memory. Without attention, encoding new stimuli becomes inefficient, leading to weaker recall and incomplete representations of experiences.

An important aspect of this dynamics is the influence of semantic information—our repository of general knowledge—on attention. Prior knowledge helps direct attention toward novel, informative elements while suppressing focus on predictable input, optimizing cognitive resources and enhancing learning. This guidance reduces the need to encode redundant information, allowing for more efficient memory formation. This paper explores how attentional patterns guided by semantic information enhance learning and memory.

To study this process we use a neural network to model the encoding and retrieval of episodic memory as a constructive process. Our network consists of (i) an encoder module (a vector-quantized variational autoencoder (VQ-VAE)) modeling the visual system which compresses an input image into a more abstract representation, (ii) an attention module that with the help of a transformer se-

mantic network masks out unrelevant information and stores the attended part as a memory trace, and (iii) a decoder module, which performs semantic completion using the same transformer network on the memory trace and then decodes it to reconstruct the memory.

Using this model we investigated three different attention strategies, random, selective, and additive, and compared their effects on learning and memory outcomes. In random attention which is our base line, the attention is distributed indiscriminately across the input, this leads to lower overall memory retrieval accuracy for all different attention levels. The lack of prioritization means that both predictable and unpredictable information are treated equally and diluting the quality of encoded representations. In contrast, selective attention feeds the entire encoded input into the semantic system and uses the transformer's logits to select the most unpredictable parts of the input for storage. This input dependent filtering significantly enhances memory accuracy by prioritizing novel, high-value information and suppressing predictable elements, sharpening the encoding process and resulting in more efficient memory formation.

Additive attention, modeled after biological saccades, processes the input part by part, allowing the semantic network to predict the next token that needs to be attended to. While this strategy is more time-consuming, it achieves the highest recall accuracy for a given level of attentional investment.

Experiments on MNIST and ImageNet datasets confirm these findings. While effects were more pronounced with simpler MNIST inputs, the attention-driven improvements persisted in the more complex ImageNet dataset, illustrating the robustness of the attention-memory interaction across varying input complexities.

This pattern suggests that attentional mechanisms guided by prior knowledge help distill complex sensory inputs into structured, meaningful constructs, facilitating faster and more accurate recall. Furthermore, tracking attention dynamics throughout training revealed a progressive refinement of attentional filters: initially diffuse, attention became increasingly precise as the network accumulated semantic knowledge. This shift underscores the iterative interplay between memory and attention, where learning continually reshapes attentional priorities to optimize future encoding.

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Emergence, consolidation, and transfer of structured memory in visual implicit learning

Apart from its traditional definition as an autobiographical and temporally dated experience that can be consciously recollected, episodic memory can also refer to a trace of a momentary sensory input—a snippet of information that may serve either as a building block for developing more abstract representations or as a subconsciously accessed piece of memory. In both roles—as subconscious snippets and as components of abstracted knowledge—this kind of information requires consolidation for long-term retention. However, behavioral measures that clearly distinguish the consolidation of such snippets from that of abstractions, as well as the consequences of each type of consolidation, remain rare in the literature. We present a study aimed at achieving such a separation, based on the phenomenon of transfer learning, which involves the re-application of previously learned higher-level regularities to novel input. Previous empirical studies have investigated human transfer learning in supervised or reinforcement learning settings, typically focusing on explicit knowledge. Consequently, it remains unknown whether such transfer occurs naturally during the more common type of implicit and unsupervised learning—and, if so, how it relates to the consolidation of non-specific, unconscious memory across different levels of abstraction.

We compared the transfer of newly acquired abstract knowledge—ranging from somewhat explicit to fully implicit—during unsupervised learning by extending a visual statistical learning paradigm to a transfer learning context. The visual statistical learning paradigm exposes observers—without any task—to a large set of compound images composed of separate shapes, and subsequently measures sensitivity to hidden structures, such as pairs of shapes that consistently repeat within the stream. We introduced higher-level features into the paradigm by biasing the dominant orientation of the hidden pairs to be either horizontal or vertical. In the transfer phase, all shapes were replaced with a new, never-before-seen set, and we measured how the horizontal or vertical structure embedded in the first phase influenced the implicit learning of new pairs of any orientation in the second phase.

Using this method, we found evidence of transfer during unsupervised learning, but with important differences depending on the explicitness/implicitness of the acquired knowledge. Observers who acquired more explicit knowledge of pair associations (without awareness of the dominant orientation structure) during the

initial learning phase were able to immediately transfer the general orientation information to the second phase by learning similarly oriented pairs better. In contrast, observers with the same amount of implicit knowledge showed the opposite effect—structural interference during transfer. Importantly, when sleep occurred between the learning phases, these implicit observers—while still remaining unaware of structures—shifted their behavior and exhibited the same pattern of transfer as the explicit group. This effect was specific to sleep and did not occur after a comparable period of wakeful consolidation.

Our results highlight both the similarities and differences between explicit and implicit learning, as well as the influence of available explicit and implicit knowledge on the acquisition of generalizable higher-level knowledge. They also underscore the complex role of consolidation in restructuring internal representations.

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Priority for Truth! How veracity and importance shape recollection

The nature of truth has long been a subject of philosophical inquiry. In modern times, reflections on the memory of truth and falsity in the writings of Spinoza and Descartes have inspired contemporary research within experimental psychology (Gilbert et al., 1990). By learning how we encode and retrieve information from memory—depending on whether we perceive it as true or false and its relevance to our goals—we can better understand how our beliefs are formed and whether we can effectively select what we memorize and defend ourselves against misinformation.

Research indicates that memory for the truth of sentences is generally better than for falsity (Ford & Nieznański, 2023, 2024; Nadarevic & Erdfelder, 2019, Experiment 2; Niedziałkowska & Nieznański, 2021, but: Nadarevic & Erdfelder, 2013; Nadarevic & Erdfelder, 2019, Experiment 1). Similarly, information labeled as "important" is better remembered than unimportant information (Ford & Nieznański, 2024). A recently discovered interaction between veracity and importance suggests that people selectively prioritize encoding „true" feedback but are not able to prioritize remembering of "false" feedback (Ford & Nieznański, 2024). However, it remains unclear whether feedback on both veracity and importance is integrated into a joint memory representation.

To address this question, we conducted an experiment on memory for both kinds of feedback and analyzed the results using a multidimensional source (feedback) memory multinomial model (Meiser, 2014). A total of 82 students memorized trivia statements of moderate plausibility, meaning that they had only vague knowledge of whether the statements were true or false (e.g., "The Statue of Liberty holds the torch in her right hand" or "Beethoven composed the opera 'Fidelio'"). Participants memorized sentences along with their corresponding veracity and importance status, resulting in four possible feedback combinations: "true and important," "true and unimportant," "false and important," and "false and unimportant." Later, in a source memory test, they were asked to indicate whether they remembered the statement and, and if so, what feedback was presented with the statement.

The analyses revealed that the model parameter representing joint retrieval of "true and important" feedback information is significantly higher than parameters representing joint retrieval of all other combinations. Furthermore, the recollection of statements' veracity was stronger than the ability to recall their importance. This suggests that veracity might be a more dominant context in memory than perceived importance suggested in the task. Additionally, participants showed minimal joint retrieval for other feedback combinations, suggesting that "false" feedback and "unimportant" feedback information are independently retrieved, a stark contrast to the dependency observed in processing "true" and "important" feedback.

These findings support previous research showing that "true" and "important" feedback information interact with each other in their effect on memory (Ford & Nieznański, 2024). The results further prompt a broader reflection on whether truth is by default perceived as important and whether something is only important if it is true. Moreover, the question arises whether our memory is inherently biased towards retaining information that is both true and important, potentially limiting our ability to use feedback to falsify or disregard misinformation.

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Episodic memory-augmented LLMs: A generative computational framework bridging AI and human memory processes

Background and Motivation

Contemporary cognitive science has established that episodic memory is not a passive storage system but rather a constructive process that actively generates and predicts experiences during recall. This generative and predictive nature presents methodological challenges for computational modelling, particularly in capturing the dynamic and hierarchical organization of human memory. Large language models (LLMs) now provide an unprecedented opportunity for testing theories of episodic memory in complex, real-world scenarios where we can precisely define and examine mathematical spaces for real-world retrieval—a capability unavailable in traditional experimental settings.

Computational Framework

We present a novel computational framework incorporating multiple key mechanisms from human episodic memory, including: (1) surprise-based event segmentation that dynamically partitions continuous experience into discrete episodic events, (2) graph-theoretic boundary refinement that optimises cohesion within events, and (3) a two-stage retrieval process combining similarity-based access with temporal context binding and contiguity effects observed in human free recall studies. This approach enables the processing of extraordinarily long contexts while maintaining computational efficiency, effectively separating working memory (active context) from episodic memory (stored experiences).

Our framework implements hierarchical episodic memory via multi-scale event organisation, a previously unexplored dimension in computational models. By leveraging inherent hierarchical processing in neural architectures, we developed head-level event segmentation methods using key similarity metrics across different abstraction levels. These similarity-based boundaries form coordinated event hierarchies that mirror the nested timescale organisation observed in human cognitive processing. Crucially, our experiments reveal strong correlations between our model's event boundaries and human-perceived events in annotated narratives, suggesting fundamental parallels between artificial and biological memory systems.

Findings and Implications

This research yields several testable predictions for cognitive science, particularly regarding selective encoding and retrieval policies: (1) global surprise signals can define individually retrievable segments across cognitive experiences, (2) the brain may retrieve episodic information independently across the perceptual hierarchy despite shared segmentation points, and (3) nested timescale structures emerge naturally from memory-augmented cognitive architectures without explicit design. Finally, the application of our framework to the visual domain reveals intriguing connections to human visual cognition. Our preliminary findings suggest that maintaining consistency in episodic event formation may be a driving force behind human gaze behaviour, thus indicating that human visual attention provides a mechanism to enable efficient episodic memory.

This framework is compatible with various compressive memory methods, aligning with theories of memory consolidation, replay-driven learning and schema formation in the human brain. Importantly, this approach can be attached to virtually any transformer-based LLM or visual language model without additional training, providing a flexible tool for cognitive science research beyond the constraints of typical laboratory settings. This computational approach provides a powerful tool for investigating how both artificial and biological systems construct coherent narratives through the generative reconstruction of fragmentary experiences—offering new perspectives on the fundamentally generative nature of remembering.

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Gluing the past back together: Episodic memory, implicit attitudes, and the Accuracy Framing Problem

Errors in episodic memory, i.e., those concerning events, are more common than not. While some of these errors are relatively insignificant (e.g., remembering my first day of school and representing the weather as slightly sunnier than it actually was), others constitute grave instances of misremembering (e.g., remembering that I closed the gas valve when I left home, despite not having done so). Among the latter, there are faulty episodic representations connected to the existence of an implicit attitude (IA), e.g., misremembering of legally relevant facts in racially

biased ways, even if these biases conflict with the witness's explicit, egalitarian attitudes. The accommodation of this type of memory error, given the widely accepted constructive nature of episodic remembering, poses challenges for the two leading theories of remembering: Reliabilism (with Simulationism as its main tenet) and Causalism.

A factive criterion of successful remembering accepts that any mismatch in content between the original event and the episodic representation renders the memory inaccurate, while constructivism acknowledges that some mismatches—as in the aforementioned 'relatively insignificant' ones—need not render the representation inaccurate, while 'grave' distortions do. Constructivist theories, either causalist or reliabilist, though theoretically and empirically sound, haven't yet established a principled criterion that meaningfully distinguishes between tolerable distortions and implicitly biased misrememberings without conflation. I refer to this impasse as the Accuracy Framing Problem (AFP).

In this talk, I argue that this challenge arises from the tension between endorsing constructivism and adopting a factive criterion of successful remembering, which naturally pairs with content preservationism. To address the AFP, I propose a revised version of the causalist approach to episodic remembering, termed the 3C model. It develops the idea of mnemic 'accuracy' in the obtaining two additional conditions, alongside the Causal one: the Correspondence one, which the 'core' elements of the episodic representation correspond to those of the original experience, and the Coherence one, by which the reconstructed contents must be those that maximize the probability of correspondence between the episodic representation and the original event. This means that non-core elements are the output of a well-functioning algorithm for optimal episodic reconstruction that utilises the cognitive system's stored statistical information. The 'core' elements of episodic representations are also influenced by pragmatic considerations: although there is a determinate, empirically discoverable set of core features, task-specific inquiries can lead to the creation of ad-hoc core features subject to Correspondence assessment. I offer a parsimonious account of episodic remembering that can accommodate pragmatic constraints and unpack the notion of 'accuracy' as a principled criterion for successful episodic remembering. Additionally, my account offers a novel argument for the causalist to defend the necessity of memory traces and the necessity of them being bearers of a certain percentage of the episodic representation's contents: them preserving the 'core' features of the event to guide reconstruction.

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Consciousness, metacognition, and the nature of successful remembering and imagining

Background

Autobiographical memory (AM) and visual imagery (VI) are internally generated cognitive processes that involve reconstructing mental representations from stored information. Exploring their neural dynamics is essential for understanding how these processes are supported by distinct brain networks. Dynamic Causal Modeling (DCM) provides a powerful framework to examine effective connectivity by estimating causal influences between brain regions.

Objective

This study examined the modulatory effects of AM and VI on functional connections of key brain regions involved in memory retrieval and imagery. Specifically, we used DCM to investigate the effective connectivity between the left ventromedial prefrontal cortex (vmPFC), left hippocampus, and left precuneus, employing Bayesian Model Selection (BMS) to identify the most plausible network architecture.

Methods

Twenty-three healthy participants (23.39 $\pm$ 4.08 years; 12 female) performed an AM task, and 19 (28.89 $\pm$ 3.67 years; 11 female) completed VI tasks (object, scene, scenario imagery). Functional MRI data were acquired and preprocessed following standardized procedures. Time series from predefined regions of interest were extracted, and subject-level DCM analyses were conducted separately for AM and VI. We specified four models that systematically varied in how conditions modulated the regional connections. BMS within a hierarchical Parametric Empirical Bayes (PEB) framework was used to identify the most plausible model. Bayesian Model Averaging (BMA) was applied to account for model uncertainty and obtain robust estimates of modulatory effects. Only parameters with a posterior probability (PP) above 0.95 were considered significant. **Results**

In AM, model 2 exhibited the highest evidence (Free Energy (FE) = 1.99, PP = 0.88) with significant negative modulations of the vmPFC-to-hippocampus

(-0.292 Hz) and vmPFC-to-precuneus (-0.618 Hz) connections. Additionally, the hippocampus-to-precuneus (0.704 Hz) connection was positively modulated. For scene imagery, model 4 was superior (FE = 2.93, PP = 0.95), with significant positive modulation of the precuneus-to-vmPFC (0.795 Hz) connection. In object imagery, model 3 showed the highest evidence (FE = 5.13, PP = 0.66), with the hippocampal (-0.276 Hz) and precuneus (0.211 Hz) connections to the vmPFC negatively and positively modulated, respectively. In scenario imagery, model 1 demonstrated the highest evidence (FE = 0.00, PP = 0.73), with negative modulation of the vmPFC-to-hippocampus (-0.652 Hz) and hippocampus-to-vmPFC (-0.741 Hz) connections, while hippocampus-to-precuneus (0.524 Hz) and precuneus-to-hippocampus (0.359 Hz) connections were positively modulated. BMA confirmed key modulatory effects in the winning models for AM, scenes, and scenarios, highlighting network robustness. However, no significant modulations were observed in object imagery.

Conclusions

The findings highlight the distinct but complementary roles of the hippocampus, vmPFC, and precuneus in AM and VI. AM primarily modulated interactions among the vmPFC, hippocampus, and precuneus, with the hippocampus playing a central role in information integration and the vmPFC regulating and sorting this information. Scene imagery relied more on the precuneus-vmPFC connection, reflecting the visuospatial and evaluative processes essential for constructing spatially coherent scenes. The vmPFC plays a prominent role in scenario construction, guiding the hippocampus to imagine temporally extended, coherent scenarios. These results provide novel insights into how distinct cognitive processes shape effective connectivity in memory-related networks.

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Binding semantic, spatial, and temporal information for cognitive mapping and episodic memory

Episodic memory, a fundamental aspect of cognitive function, enables us to remember not just what happened but also where and when. Therefore, forming episodic memory requires mentally binding spatiotemporal and semantic informa-

tion. The hippocampal-entorhinal formation (HEF) plays a central role in this process. The entorhinal cortex creates a spatiotemporal scaffold [1,2], which the hippocampus associates with semantic information in the neocortex [3,4,5]. Such episodic memories are then consolidated in cognitive maps, enabling efficient storage and retrieval. To enable the HEF to form such cognitive maps, a mechanism to create a reliable world-centric spatial encoding is needed. This world-centric position is represented in the brain through spatially tuned neurons called grid cells [1] in the entorhinal cortex.

Due to this world-centric spatial encoding, revisited places are not stored as duplicates. Instead, revisiting leads to a recall and possible update of semantic information associated with that position in the map. This way, cognitive maps bind semantic information to spatial context in a world-centric reference frame, so only partial information is needed to reconstruct the complete experience. Location can be used to reconstruct semantic information, and vice versa.

In this work, we explore episodic memory and cognitive mapping from the perspective of Vector Symbolic Architectures (VSAs) [6], a framework bridging neural and symbolic computation. We have shown that grid cells can be modeled as a high-dimensional, distributed VSA encoding, which we call Grid-Cell VSA (GC-VSA) [7]. GC-VSA reproduces grid cell-like neural activity, can perform spatial navigation, and represent and bind spatial, episodic, and semantic information.

For example, to represent an apple seen at position (x,y) at time t, one binds the semantic encoding for the apple with the spatial and temporal encoding. This bound representation can then be queried using only partial information, such as location, to reconstruct the temporal and semantic information (e.g., the encoding for 'apple').

Our ongoing work also investigates how world-centric spatial encoding is anchored in the real world using only egocentric information, such as relative object distances and head direction [8]. Such anchoring is required for robust and consistent spatial representation when revisiting the same location (physically or mentally), enabling fast and reliable reconstruction of stored memories from a cognitive map.

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Temporal distortions and confabulation: Unraveling the neurocognitive mechanisms behind autobiographical false memories

Confabulation is a particular symptom observable in some amnesic patients, unaware of their memory deficit, which consists of statements that are unintentionally incongruous to the patient's history, background, present and future situation (Dalla Barba, 1993).

A distinction has been made between different types of confabulations, with the most widely recognized classification introduced by Kopelman (1987). Accordingly provoked confabulation is plausible minor memory distortion that occurs in response to direct questioning or during a test situation. Spontaneous confabulation is unprovoked and often involves implausible memories. Provoked confabulation is considered as a normal response to a faulty memory, whereas spontaneous confabulation is thought to result from the superposition of frontal/executive dysfunction to an organic amnesia. However, in some cases, spontaneous confabulations can be plausible and provoked confabulations are bizarre and implausible. In this line, confabulation can be more reliably distinguished based on the semantic quality of its content as ''semantically appropriate'' or ''semantically anomalous'' (Dalla Barba, 1993), regardless of its modality of appearance (spontaneous vs. provoked).

Given the complexity of this phenomenon, a generally accepted theoretical account of its underlying neurocognitive mechanisms has yet to emerge. In the domain of cognitive neuroscience, some accounts place significant emphasis on the role of frontal/executive dysfunction in confabulating patients, particularly in relation to the function of strategic retrieval and monitoring processes (Moscovich & Melo, 1997). Conversely, alternative theoretical frameworks posit that confabulation can emerge as a consequence of an impairment that pertains to personal temporality.

According to the Memory, Consciousness, and Temporality Theory (MCTT) (Dalla Barba, 2002), confabulation is not a pure memory disorder, but a disorder involving temporal consciousness (TC). TC means becoming aware of something as part of a personal past, present or future. In this talk I will present neuropsychological and experimental evidence with results from different studies carried out on amnesic confabulating patients of different neurological etiology showing a dysfunction of TC. It has been demonstrated that confabulators frequently generate false memory reports, not only in relation to their past, but also with regard to the present and their personal future.

Moreover, confabulation often involves patients using their habits, routines, and overlearned information in inappropriate contexts, a symptom referred to as habits confabulation. For instance, when asked about their activities from the previous day, hospitalized confabulators often report routines from their life before the disease onset, such as saying they went to work or had dinner at home "as usual". In this case, irretrievable episodic memories, i.e., specific events tied to a particular time and space context, are replaced by routines, i.e., multiple, repeated events.

Results will be discussed within the framework of the MCTT and the others cognitive models proposed in the literature to explain the cognitive mechanisms underlying confabulation, in particular the frontal/executive account.

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Movies of our minds: Patterns of hippocampal subfields during object, scene, and scenario construction

Episodic scene construction, the process of mentally generating and manipulating spatially coherent scenes, is a critical function of the hippocampus. However, the specific contributions of hippocampal subfields to different forms of construction—object-, scene-, and scenario—remain unclear. Emerging evidence suggests distinct roles for different subfields, highlighting the role of the pre-/parasubiculum in scene-based cognition. Additionally, separate neural circuits within the hippocampus may underlie object-based recognition, spatial scene construction, and the temporal organization of scenarios. Understanding these func-

tional specializations is essential for elucidating the neural mechanisms engaged during visual mental imagery.

Therefore, we instructed 19 healthy young participants (age: 27.89 $\pm$ 3.67 years old, Males: 8) to construct mental visuoperceptual images consisting of three different types of imagery word cues: 15 objects (e.g., espresso), 15 scenes (e.g., mountain range), and 15 scenarios (e.g., concert). As control task, the participants were to count the number of letters if they perceived the word cue as 15 non-words (e.g., Tribuomnus). The MRI imaging data were acquired using a MAGNETOM 7T Plus ultra-high field scanner, including a 0.6 mm isotropic whole-brain structural T1-weighted scan, three rapid T2-weighted reduced field-of-view scans, and task-based customized rapid whole-brain submillimeter fMRI multishot 3D echo planar imaging (EPI) sequence. MRI data pre-processing was performed using the SPM12. Manual segmentation of bilateral hippocampal subfields (DG/CA4, CA3/2, CA1, subiculum, pre-/parasubiculum, and uncus) was performed on the averaged and denoised T2-weighted structural scans from each participant.

Significant main effects were observed in the hippocampus subfields during all imagery trials in comparison to non-word condition, including object ($F(19,4) = 3.34$, , $p = 0.03$), scene ($F = 7.512$, $df = 4$, $p = 0.0022$), and scenario ($F = 6.453$, $df = 4$, $p = 0.002$) imagery. RM-ANOVA revealed main effects of signal changes in the subfield activations during scenario subtracting scene ($F = 3.335$, $df = 4$, $p = 0.0454$) and scene subtracting object ($F = 8.232$, $df = 4$, $p = 0.0011$). Greater activations were observed in both CA2/3 and pre-/parasubiculum during scene and scenario conditions, while Tukey's multiple-comparison test revealed significant difference of percentage signal change between CA2/3 and the pre-/parasubiculum ($p = 0.0232$), with only a trend between DG/CA4 and the pre-/parasubiculum ($p = 0.0939$). Independent from the activation extracted from the entire hippocampus, only during the scenario construction in the anterior body ($F = 6.453$, $df = 4$, $p = 0.002$) and the posterior body ($F = 6.453$, $df = 4$, $p = 0.002$) displayed main effects of signal change in comparison to the non-word condition. Moreover, signal intensities between different conditions displayed differential activation within the anterior body of the hippocampus. Greater signal intensities were observed in pre-/parasubiculum than CA1 in both scene ($p = 0.0304$) and scenario ($p = 0.0397$) subtracting object trials.

Our findings suggest that the pre-/parasubiculum plays an important role during scene imagery compared to object imagery, while CA2/3 exhibited the strongest activation during scenario imagery, highlighting their engagement in

constructing complex mental representations.

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Mnemic representations of objects: Accounting for the diverse singular content of episodic thought

The object representations in episodic memories are a motley bunch: In 'paradigmatic' cases like memories from veridical experiences (e.g. remembering the spider from my office webbing), these representations are both particular [= about a certain object/spider] and actual [= about a real-world object]. However, neither particularity nor actuality obtain in all cases: Examples of memories with non-particular object representations are 'generic' memories (e.g. remembering the steel-cut oatmeal that I used to cook every Monday; Langland-Hassan, 2022), [[1]]. Examples of memories with non-actual object representations include memories from dreams (remembering myself, in my dream, win the Nobel Prize for philosophy; Michaelian, 2024), [[2]]. Many dream memories even combine non-actuality with non-particularity (e.g. remembering the car from my dream that was both red and green all over; Michaelian, 2024), [[3]].

My talk uses diverse object representations like [[1]] to [[3]] to defend a moderate version of simulationism (Michaelian, 2016). According to this version, mnemic event-representations are obtained by combining chunks of representations that may originate from multiple, qualitatively different episodes (using Mahr and Schacter's (2024) 'episodic recombination'). These representations can encode for a particular person or object (through concept cells, see Quiroga, 2012; or by combining representations of the person's personality traits, see Hassabis et al., 2014). This object-specific encoding establishes a relation to the target individual without resort to 'full' memory traces (which link the representation to a complete episode containing this individual).

Because these representations can also encode for non-actual objects (Luke Skywalker, or the Nobel Prize for philosophy), they avoid the actuality-restriction of causal theories of memory (e.g. Bernecker, 2010; Werning, 2020; which cannot account for cases like [[2]] and [[3]]). Since they encode for a particular object, these representations can moreover capture the distinction between particular and non-particular representations, which escapes the simulationist theory of memory (Michaelian, 2016): Because simulationism treats both non-actual and

non-particular objects alike (as 'intentional objects'; see Michaelian, 2024), it cannot explain why only [[2]] – but not [[1]] – validates particularity-inferences of the form 'A remembers *a certain* x P'ing'.

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A compositional account of episodic simulation

According to the 'episodic simulation hypothesis', episodic memory and imagination are both underwritten by a unitary constructive process. While there is solid evidence to support this hypothesis, the nature of this 'episodic simulation' process remains largely underspecified. Here, I will present some motivations for thinking about episodic simulation as a compositional process. On this view, representational contents of episodic representations are the result of the combination of lexical elements according to syntactic rules across levels of a representational hierarchy. Specifically, I will argue that (1) evidence from cognitive neuroscience regarding episodic simulation, (2) the failure of purely associationist accounts of episodic simulation, (3) the hierarchical nature of episodic representations, and

(4) the flexibility of episodic simulation all provide reasons for us to think about episodic simulation in such compositional terms.

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How do our memories take shape?

How our brains support our ongoing conscious thoughts, and how (and what) we remember are some of the greatest mysteries of our species. My lab is pushing our understanding of these questions using computational models and neuroimaging. In my talk, I'll discuss how I have approached this work on two main fronts. First, I want to know how our thoughts and cognitive processes change over time (e.g., alongside our ongoing experiences, in different contexts or situations, etc.). To this end, I am advancing cognitive theories by building models of semantic and conceptual spaces, and of how we learn and remember. Second, I want to know how our brains support our thoughts and cognitive processes. To this end, I am advancing neuroscientific theories by building computational models of brain network dynamics, studying neural representations, and elucidating connections between activity patterns at different spatial and temporal scales and across different individuals. In several studies, I have also started to bridge these two approaches by using neuroimaging data to test specific cognitive theories, and by using cognitive theories to interpret neuroimaging data.

Studying these questions often entails developing new methods and tools, as opposed to simply applying existing approaches. I am especially interested in understanding real-world learning and memory, and other cognitive processes we draw on in our everyday lives. Therefore many of the tasks we use in my lab incorporate so-called "naturalistic" stimuli such as television shows, movies, stories, materials from online courses, natural conversations, and so on. Unlike simpler traditional laboratory stimuli like static images or random word lists, modeling these more complex stimuli has required inventing new techniques and mathematical formalisms. Similarly, connecting real-world cognitive processes to brain activity patterns has required developing new ways of measuring and characterizing neuroimaging data.

In addition to advancing theory and building tools, a core goal of my work is to use the scientific insights gained from my (and others') research to meaningfully

improve people's lives. I am particularly interested in lowering barriers to receiving a high-quality education by improving how teachers teach and how students learn. I'll give a preview of my lab's most recent work in education, which has begun to tie together our work on cognitive and neuroscientific theory and methods development.

Adam Manoogian, **Adeel Razi**, **Jakob Hohwy**

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An active inference model of contextual inference in schizophrenia

The learning and decision making processes underlying differences in performance on behavioral tasks in schizophrenia patients are not yet clear. Traditionally established cognitive patterns such as 'jumping to conclusions' and a 'bias against disconfirmatory evidence' are proving inconsistent under scrutiny or aligned only to certain symptoms at times of severity. Despite the wide history of context misinterpretation in schizophrenia, the influence of contextual inference in decision making tasks remains underexplored. When incorporating contextual influence, an agent must decide on the relevant context (with associated statistics and values) to retrieve and then update. We argue that including an ongoing process of latent state inference can better capture these behavioral tendencies, such as increased switch rates and a failure to form precise beliefs. The change in latent state in response to noisy information is akin to retrospection, or a re-updating of the relevance of past beliefs. Here, we use an active inference agent modified with contextual updating in a sequential predictive inference task. Contextual updating is explored as the effect of nonparametric modulation on a hybrid model (one that includes both discrete and continuous levels). Disrupted message passing is used to mimic updating and retrieval processes in our model. The role is placed in context to previous findings of classical neural network memory models of schizophrenia, including circular inference. We include future directions for neurobiological targets, including prefrontal cortex - hippocampal circuitry responsible for replay mechanisms. In sum, this work aims to bridge patterns in decision-making to behavioral and neural correlates increasingly interpreted as cognitive map representations within schizophrenia.

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Philosophical accounts of confabulation: (Why) should empirical memory researchers care?

The talk sums up the state of the art in philosophy with respect to confabulation and considers interactions between philosophical and empirical research on confabulation. It proceeds in four steps. First, it retraces the confabulation debate in philosophy of memory. Second, it asks why that debate appears to have died down. Third, it considers future directions for philosophical accounts of confabulation and related memory errors. Finally, it asks whether and why memory researchers in psychology and cognitive neuroscience should be interested in such accounts.

The first part of the talk reviews the emergence of competing accounts of confabulation following Robins' (2016) distinction between confabulation and misremembering, focussing on causalist (Bernecker 2017; Robins 2019, 2020) and simulationist (Michaelian 2016, 2020, 2023) accounts. Whereas causalists explain the relationships among confabulation, misremembering, and related errors in terms of the presence/absence of appropriate causation, simulationists do so in terms of production by a reliable/unreliable episodic construction system. Despite this explanatory difference, causalists and simulationists provide broadly analogous taxonomies of memory errors.

The second part responds to Bernecker's (2023) claim that the debate between causalist and simulationist accounts is a stalemate, arguing that the claim is plausible only if we reject the possibility of future-oriented confabulation. Since future-oriented confabulation is empirically well-established, and since simulationism can but causalism cannot provide a unified account of past- and future-oriented confabulation, simulationism seems, given that philosophical accounts of confabulation are meant to be naturalistically acceptable, to have the advantage. The fact that the debate appears to have died down is thus not explained by the fact that it is a stalemate; the explanation is most likely sociological, pertaining to the limited number of researchers specializing in philosophy of memory.

The third part considers future directions for the confabulation debate, focussing on two. First, Openshaw and Michaelian (2024) argue for the possibility of referential confabulation, providing an initial simulationist account of that phenomenon. Given that causalists have yet to provide such an account, ref-

erential confabulation might provide a means of adjudicating between causalist and simulationist approaches. Second, there is growing interest in the implications for memory errors of representationalism and relationalism about memory (Sant'Anna 2022). The relationship of the representationalist-relationalist debate to the causalist-simulationist debate is complex (Aranyosi 2020; Moran 2022), but the former debate might in principle provide a means of advancing the latter.

The final part of the talk asks whether and why empirical researchers should be interested in philosophical accounts of confabulation. Noting that empirical researchers have not so far been concerned with these accounts, it considers two possibilities. First, philosophical accounts might be irrelevant to empirical research on confabulation even while being inspired by it. Second, certain products of the philosophical debate, such as the distinction between referential and nonreferential confabulation, might be relevant to empirical research, though their relevance has not yet been recognized. It comes down tentatively in favour of the latter possibility.

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Simulation: Spatial, episodic or something in between

Theorists frequently draw on cognitive map theory to understand the function of episodic memory (Aronowitz, 2022). One way theories about episodic memory draw on spatial representations is by arguing that mechanisms of memory have evolved from mechanisms of navigation (Buzsáki & Moser, 2013). However, when examining the relationship between episodic simulation (which many consider episodic memory's primary function; De Brigard, 2014; Schacter & Addis, 2007) and spatial representation as an evolutionarily prior functional component, Two interpretations emerge regarding spatial representations:

(i) The production of cognitive maps is the originally selected function of the hippocampus.

(ii) Cognitive maps are produced by a memory system whose selected function is constructive simulation.

Some lines of evidence actually point towards the fact that paradigmatic instances of hippocampal spatial cognition already involve simulation, Specifically,

the appearance of forward and remote sequences in hippocampal replay suggests the capacity to plan by replicating potential and hypothetical trajectories (Ólafsdóttir et al., 2018). These findings indicate that spatial representations require a process that is closer to running a simulation rather than consulting a cognitive map, highlighting the close relations between hippocampal spatial representation and simulation (Humphreys, 2004). This calls into question the assumption that spatial cognition is an evolutionary building block of an episodic memory system that trades in simulation.

In my talk, I will show how spatial representation is better understood as a product of a simulation system rather than as a functional component. Characterizations that challenge the spatial-first hypothesis, I will argue, undermine attempts to cast spatial representations as an evolutionary building block of the episodic memory system. These considerations highlight a more general point: how we characterize the explanandum phenomenon carries the risk of a theoretical corral, determining how we trace back the evolutionary history of cognitive functions.

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Learning to remember, remember to learn

The brain maintains internal models that can serve efficient planning and decision making. Recently, it has been argued that these internal models can be interpreted as ensuring optimal compression of experiences. The theory of lossy

compression, rate distortion theory, indicates that adapting this internal model to the statistics of the environment can also ensure optimal use of memory resources. By adopting tools from machine learning we show that such optimality predicts a range of memory errors too. While the theory of lossy compression is a potent framework to explain what we remember and what we forget, it is at odds with a salient property of memory: we tend to remember surprising events in high detail while the theory of lossy compression suggests that the memory is least fit for encoding such surprising data. We propose that this feature of episodic memory actually compensates for a challenge of lossy compression: continually adapting the core of compression, the statistical model of the environment. We demonstrate that episodic memory helps to overcome resource constraints of online Bayesian learning of a statistical model and explains curriculum effects in a contextual learning task.

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Mnemic justification and the sense of reality

I look out my kitchen window and see that it is raining and that the garden is wet. Later, I return to the kitchen and notice that the rain has stopped, but the garden remains wet. Recalling that it rained earlier, I justifiably conclude that the garden is wet because it rained. Now, suppose I had not witnessed the rain before. In this case, upon seeing the wet garden, I might wonder: Did it rain, or was the garden watered? Without access to additional evidence—such as a weather app or someone's testimony—I cannot rationally decide between the two possibilities.

This example illustrates that both perception and episodic memory can justify beliefs about what is actually the case, whereas imagination—at least in this context—cannot. Perceiving that it is raining justifies my belief that the garden is wet (because it is raining). When I remember that it rained half an hour ago, I am justified in believing that the garden is wet because it rained. However, if I merely imagine that it rained, I am not justified in forming the same belief (Hopp 2011).

What explains the shared epistemic power of perception and memory? A widely accepted view holds that a mental state's justificatory power stems from its phenomenal character—such as the Leibhaftigkeit (Husserl 2005) or transparency of

perception (Martin 2002). This character explains why we tend to 'trust' perception and reliably base our beliefs on it. In certain cases, such as the one above, we reliably form beliefs based on memory too. To fully understand mnemic justification, we must analyze the phenomenal character of memory itself. A key question is identifying the shared phenomenal feature that enables both memory and perception to justify beliefs.

I propose that this common feature is the sense of reality, which—drawing on early phenomenological accounts of "objective experience" (Textor 2019)—I define as the sense of the represented object's independence from the act of representation. This crucial aspect of the phenomenology of remembering has been overlooked in contemporary philosophy of memory (Dokic 2014; Perrin, Michaelian, & Sant'Anna 2020), yet it is essential for understanding mnemic justification.

This paper highlights the role of the sense of reality in mnemic justification, offering a conceptual framework open to empirical refinement. It invites further research into the relationship between memory, perception, and justification.

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Collective remembering and grieving of place disruptions

Imagine the following scenario: the fire that broke out on April 15th, 2019, at Notre Dame, a renowned symbol of Paris. The images of the cathedral in flames were profoundly emotional for many French and European individuals. Imagine that people were present during the fire, experiencing no serious injuries but retaining the memory of the traumatic event. In times of collective mourning, people gather at the site of the disruption, engaging in a shared narrative of recalling the details and elements of the place's disturbance, and bonding over the shared traumatic experience.

Places and inter-subjectivity are strongly tied. Places are not simply spatial locations but should be understood as the environmental and social settings we inhabit and share with others from a young age (Casey, 1993). It is in places that we gather and socially bond: around the table of a living room, in bars at the end of a working day, in institutional buildings to make political decisions. Memories of shared experiences in places often play a fundamental role in our social and collective identities (Halbwachs, 1950). These shared place experiences are essential in bonding communities and reinforcing our collective identities. The buildings, monuments, and historical sites from our collective past shape the social and cultural landscape of our lives. As Sutton (2024) points out, this may also explain why disruptions to places (whether due to natural or social factors) can be traumatic for communities, as they lose their sense of security and familiarity. This paper explores how, during collective grieving, we gather in places to remember traumatic experiences and how these places hold collective memories.

I propose three axes of investigation. The first axis regards the memory processes. According to contemporary theories of memory (e.g. Addis, 2018; Cheng et al., 2016), memory is a constructive episodic simulation process in which different sources of information produce a perspectival and informationally rich mental scenario of the past experience. With the aid of Husserl (2005), Gyollai (2024) argued that a mutual redirection of attention might be involved when collectively and conversationally constructing personal memories. Following Gyollai, I argue that constructing memories from another person's perspective is part of processing the traumatic event. The second axis involves the re-enactment of experiences in remembering. Reinstatement of subjects in the same places of the events facili-

tates remembering (Smith and Vela, 2001). However, I argue that returning to the places of the events also allows re-enacting experiences, by virtually staging the memories of the event in places (Righetti, 2024). The third axis concerns the role of collective emotions in social groups (Salmela, 2014), leading to group recognition of each other grief and loss. I argue that places become emotionally charged location for the group to identify each other as the ones who commemorate their lost sense of security and familiarity, leaving physical traces behind, such as plagues and monuments.

I expect that this investigation will contribute to further understanding how place memory and collective remembering are complementary aspects of our collective identity.

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Mnemic Perspective doesn't matter

I can recall a field perspective experience (e.g. me swimming in the sea) from an 'own-eyes' (field) or an onlooker (observer) perspective [3]. In field perspective recall, I am constructing a scenario of what my swimming felt like for me (the salty taste of the water). In observer recall, I am constructing a scenario of what my swimming would have looked like for someone watching me (my body being tossed about by the waves; [4]).

Work in semantics and the philosophy of language suggests that agents' verbal memory reports capture this perspective: Since control constructions like English subjectless gerunds (1a) and German participial 'zu'- ['to'-]constructions (2a,b) are commonly taken to express self-locating contents [1], one would expect that they can be exclusively used to report field memory (Hypothesis I). The availability of a designated linguistic tool for field perspective suggests that other constructions like English reflexive gerunds (1b) are used to report observer memory (Hypothesis II).

(1)
a. I remember swimm**ing** in the sea.
b. I remember **myself** swimm**ing** in the sea.
(2)
a. Ich erinnere mich, im Meer **ge**schwommen **zu sein**.

[I remember-REFL in-the sea swim-PARTICIPLE-PERF to be]
b. Ich erinnere mich, im Meer **zu** schwimmen.
[I remember-REFL in-the sea to swim-INFINITIVE]

We have recently conducted the first-ever studies that test these hypotheses. Our English (n=37) and German (n=54, after exclusions) acceptability judgement studies test, for each construction from (1)/(2) (plus 'remember that'-sentences) and a depicted perspectival experience (field or observer) how well (on a scale from 1 to 7) the construction reports the agent's constructing a depicted perspectival mnemic scenario (field or observer) of this experience.

Surprisingly, the results of this study falsify both Hypotheses I and II. In particular, the studies have found that German 'zu'-constructions like (2a,b) do not mark field perspective (thus refuting Hypothesis I). At the same time, English memory reports with reflexive gerunds like (1b) do not mark observer perspective (refuting Hypothesis II). Importantly, the results are specific to memory reports and cannot be explained from participants ignoring perspective altogether: In non-memory related contexts within the study, 'myself' does mark observer perspective.

Our findings support the idea that memory reports are a high-level cognitive phenomenon, possibly involving judgements of the interlocutor's epistemic authority, but no theory about the phenomenology of the rememberer's experience. This matches [2]'s observation "that the differences between field and observer perspectives in the folk concept of memory are not as marked as in much philosophical theorizing" (p.3). This locates the language of remembering in proximity to folk psychology and in opposition to phenomenology and non-meta cognition.

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Consciousness, metacognition, and the nature of successful remembering and imagining

There are two different types of theories of remembering in the philosophical literature: consciousness-inclusive and consciousness-exclusive ones (Sant'Anna 2023). According to consciousness-inclusive theories, remembering is not only a matter of retrieving information previously acquired in the past, but also a matter of having a distinctive type of conscious experience when accessing that information. According to consciousness-exclusive theories, in contrast, remembering is just a matter of retrieving information previously acquired in the past; no reference to consciousness is required to properly define what it is to remember. Recently, McCarroll and Sant'Anna (2023) have argued that two of the most prominent versions of consciousness-exclusive theories fail to account for a specific form of memory error: cryptomnesia. Cryptomnesia is, at the most fundamental level, a phenomenon in which one takes oneself to be engaged in an act of creative imagining, but the content of one's mental state was (at least in part) something that one previously entertained. According to McCarroll and Sant'Anna, due to excluding considerations about the conscious dimension of remembering, consciousness-exclusive theories have the undesirable consequence of classifying cases of cryptomnesia as successful cases of remembering. This paper builds on the approach developed in McCarroll and Sant'Anna (2023) to do two things. First, we further criticize consciousness-exclusive accounts, arguing that they mistakenly classify some cases of successful imagining as cases of successful remembering and some other cases of successful imagining as memory errors. Second, we propose that these issues can be remedied by incorporating a consciousness condition into the definition of remembering. More specifically, we argue that such a consciousness condition is best cashed out in metacognitive terms: i.e., in terms of source- and process-monitoring processes. We conclude by highlighting other advantages of favoring a consciousness-inclusive theory of remembering in a more general philosophical setting.

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Remembering without (representational) memory: A neurocomputational study on regaining categoricity and compositionality from minimal traces

This paper presents a proof of principle for Trace Minimalism, a theory of episodic memory proposed by Werning (2020). The theory suggests that remembering does not rely on stored representational content but instead emerges through reconstructing past experiences via minimal traces interacting with semantic information. Minimal traces serve as causal links to past events without preserving detailed content.

Our model shows that although minimal traces lack enough information to independently categorize or compose content, they can still support accurate recall when enriched by semantic knowledge. This interaction enables the reconstruction of past scenarios in alignment with real-world regularities, reinforcing the reliability of episodic memory. These findings suggest that memory relies on sparse, fragmented traces rather than stored representations, validating the core claims of Trace Minimalism.

To test this, a biologically inspired neural network was developed. The model, trained to recognize two-digit numerals divisible by three, learned statistical regularities of numeral shapes and grammatical rules. During recall, the network reconstructed numerals from traces containing only 3.16% of the original perceptual information. Despite this severe reduction, accurate numeral representations were produced through semantic completion, supporting Trace Minimalism's claims.

The model exhibited sensitivity to grammatical rules, with higher recall accuracy for grammatically valid numerals, even for unseen combinations. It also showed a bias toward prototypical representations, aiding memory reconstruction — an effect observed in human cognition. These results align with empirical evidence that people rely on semantic regularities to fill gaps in fragmented memories.

Trace Minimalism offers a middle ground between classical and simulationist theories of memory. Unlike the Classical Causal Theory, it accounts for constructive processes without assuming full content preservation. Unlike Simulationism, it retains the necessity of causal links. The findings suggest that episodic memory can arise from sparse, fragmented traces, reshaped by semantic knowledge, offer-

ing a promising framework for understanding memory as a dynamic, reconstructive process.

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The experience of pastness in autobiographical memory retrieval: A two-level approach

The phenomenological experience of remembering has consistently been tied, necessarily, to a kind of feeling (e.g., Dokic, 2014; James, 1890; Perrin et al., 2020; Russell, 1921; Tulving, 1983). Here I present an alternative position. I argue that the temporal phenomenology of episodic autobiographical memory (EAM) is not necessarily a type of feeling, but can also be a type of judgment, more specifically a metacognitive judgment. Focusing on evidence for two types of memory retrieval processes: direct retrieval (effortless), and generative retrieval (effortful) (Addis et al., 2012; Barzykowski & Staugaard, 2016; Conway, 2001; Harris et al., 2015), I present a challenge to the prevailing view: the affectivalist view (Dokic, 2014; Perrin et al., 2020; Perrin & Sant'Anna, 2022), by arguing that although they explain phenomenology in direct retrieval they fail to explain generative retrieval phenomenology. In my view, to explain generative retrieval phenomenology, one must make room for a phenomenology of metacognitive judgments.

Briefly, affectivalists argue that type-1 metacognitive processes, which evaluate fluency of memory construction, give rise to a metacognitive feeling of pastness in EAMs (Perrin et al., 2020). I contend that such an approach is insufficient for explaining generative retrieval, a process that presupposes the deployment of attentional resources to steer memory construction and evaluation (Conway et al., 2019), exceeding heuristic-based processing. Thus, while affectivalism explains direct retrieval phenomenology, which presupposes a ballistic retrieval process, some room for type-2 processes must be made to account for generative retrieval phenomenology.

Generative retrieval is consensually thought to require conscious access to first-order information (Barzykowski & Staugaard, 2016; Conway, 2001; Conway et al., 2019; Harris et al., 2015), pointing to a type-2 monitoring process. This would generate a type of metacognitive judgment, instead of a metacognitive feeling. I argue that, in generative retrieval, individuals engage in a conscious assessment

of how well the instantiated activation pattern matches a retrieval model—a conceptual framework grounded in background knowledge about the memory's autobiographical context (cf., Conway & Pleydell-Pearce, 2000). This evaluation leads to the generation of a judgment of pastness, which informs the individual that the constructed memory originates from their personal past because it is properly contextualized in relation to one's autobiographical knowledge base.

Furthermore, taking a liberal view on cognitive phenomenology, I defend that propositional attitudes, such as judgments, can have a proprietary phenomenology that is the same (in kind but different in degree) as that of metacognitive feelings. Thus, I argue for a dual-level approach to EAM phenomenology, in which both type-1 metacognitive feelings and type-2 metacognitive judgments have a substantial role in providing the particular temporal experience of remembering in the direct/generative retrieval continuum. My view would also help to explain why phenomenological ratings of generative retrieved memories are more modest, with them being conceived as less personally significant and overall less vivid than direct retrieved ones, but still considered as remembered instead of merely known (Addis et al., 2012; Harris et al., 2015).

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ABSTRACTS - POSTERS

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PS1/19

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Autobiographical memory in congenitally and late blind individuals in comparison to sighted controls

Accumulating evidence indicates that mental visual images are important for episodic autobiographical memory (AM). For instance, individuals with aphantasia (i.e., lack of mental visual imagery) have difficulties in episodic AM retrieval, emphasizing the relevant link between AM and the generation of mental visual images. Blind people do not have the capacity to encode visual information, due to congenital or early-onset degenerative loss of functional ophthalmological integrity. Therefore, our primary aim was to study the effect of blindness on AM retrieval. Secondly, we aimed to investigate how AM retrieval differs between sighted individuals and individuals with congenital and late blindness. We hypothesized that blind participants would report significantly less visual-perceptual details than sighted controls. Since memory encoding and retrieval are closely linked to sensory experience, the neural reorganization of congenitally blind people occurs from birth by relying on non-visual sensory information. Late blind individuals have been able to generate visual images over the course of their lives, so that a shift from visual to non-visual details is involved. Therefore, we expected a lower AM performance only for the late-blind group. We included a total of 79 participants in our study (Age: M = 54.51, SD = 16.40; Years of education: M = 17.29, SD = 4.33; Gender: 46 males, 33 females) to investigate AM in congenitally blind (N = 21), late blind (N = 22; duration of blindness Min. = 4 years, Max. = 58 years), and control participants (N = 36) with the semi-structured Autobiographical Memory Interview (AMI). In this interview, participants were asked to recall and narrate five personal life events that were audio recorded, transcribed, and later scored by two independent raters according to procedures specified by Levine (2002). Age-corrected repeated measures two-way analyses of variance and multivariate analyses of variance have been conducted to investigate group differences across detail types. Results indicated no differences between

the three groups in the overall number of remembered episodic (internal) details and semantic (external) details. As expected, the control group recalled more visual details than the congenitally blind group ($p < .001$), and the late blind group ($p < .001$). Moreover, the congenitally blind participants recalled more auditory and tactile details compared to the control group. Sighted control participants recalled significantly less time details than congenitally blind ($p < .001$) and late blind participants ($p < .05$). Interestingly, the late blind group recalled more internal details from episodes after becoming blind than from when they were sighted ($p < .05$). However, there was a significant decrease in the number of mentioned visual-perceptual details in episodes in which they were sighted compared to those episodes in which they were blind ($p < .05$). We conclude that blindness - in contrast to aphantasia - is not associated with an overall AM deficit. Differences between congenitally blind, late blind, and sighted control participants emerge on the number of specific detail categories, especially internal, auditory, tactile, and time details.

*These authors contributed equally to this work.

Magdalena Abel, **Johannes Bartl** **PS2/14**

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Information transmission during collaborative remembering: Majority vote or fine-tuned affair?

Engaging in remembering together with others can shape subsequent individual memory. For example, social exchange can result in false memories, with individuals later remembering information that was in fact initially encoded by others. Such social contagion has recently been examined in collaborating triads, and here, it seems that information is transmitted more easily when it was initially studied by two rather than one of the other group members. The reason for this pattern is unclear, however. Is group majority decisive? Or are humans in fact sensitive to the degree of support in social groups, such that information is more likely to be accepted the more group members were initially exposed to it? Two experiments were conducted to address this question. Both experiments recruited groups of six participants and varied information distribution during initial encoding, with certain pieces of information being studied by 1, 2, 3, 4, 5, or 6 of the group members. After completing an interpolated recognition test collaboratively or individually, all participants took a final individual recognition test, which allowed us

to assess information transmission. Experiment 1 used unrelated news headlines as study materials. For these complex materials, effects of prior social interactions turned out to be small, but social contagion with information initially studied by other group members increased linearly with the number of group members who had studied the information. Experiment 2 used unrelated words as study materials. Preliminary data suggest more pronounced effects of collaboration for these simpler materials, but social contagion again seems to increase linearly with the number of group members who were initially exposed to the information. If supported by the full data set, these results would indicate that social information transmission is indeed quite fine-tuned to the degree of social support during collaborative remembering.

Aya Altamimi **PS2/13**

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Modelling the effect of audience tuning on generative episodic memory

"Research indicates that episodic memory is highly malleable, particularly influenced by external suggestions and biases during social interactions. This suggests that memories are not fixed but rather reconstructed, with incomplete memory traces being filled in by semantic knowledge that is shaped by motivational and social contexts. Experiments further demonstrate that individual recollections can align with a shared reality created through communication. The saying-is-believing (SIB) paradigm highlights how verbalizing information can not only alter an audience's perception but also change the speaker's memory and attitudes.

Despite these insights, many computational models of episodic memory have maintained a view of memory as faithful storage, overlooking the impact of social interactions. To address this gap, we have developed a generative model of episodic memory, which we extend by incorporating the social dimension.

Our enhanced model introduces several key innovations: (i) the combination of multiple memory traces to represent information blending, (ii) the incorporation of emotional valence and biased completion to account for affective influences on memory, and (iii) the handling of ambiguous stimuli to reflect real-world complexity. Together, these advancements enable the model to simulate and fit experimental data on the SIB effect and social influences on memory, providing deeper insights into how verbalization and social contexts shape the construction

of episodic memory."

Géza Gergely Ambrus, **Madeline Molly Ely** **PS2/24**

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Neural dynamics of facial expression processing: Implications for memory formation

A wide body of research suggests that angry faces are prioritized for processing, capture attention more readily, and are better remembered—an effect known as anger superiority. Other evidence supports a happiness superiority effect, where happy faces receive prolonged attention, are processed more efficiently, and are recalled more accurately. In an EEG study (n=24), participants completed a two-alternative forced-choice task, identifying facial expressions as angry, happy, sad, or neutral. Using cross-participant multivariate classification and representational dissimilarity analysis, we examined whether the neural representations of facial attributes, specifically identity and sex, are modulated by emotional expressions. Our results have shown that anger, and to a lesser extent happiness, enhances the neural coding of face-identity and sex. This suggests that emotional expressions strengthen the neural representations of facial attributes, which may, in turn, facilitate memory encoding and retrieval. These findings provide further evidence that affective salience and social memory processes are deeply intertwined.

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Effects of repeated retrieval on memory reconstruction for naturalistic images

Episodic memory allows us to mentally revisit past experiences by reinstating neural representations of events. However, memory retrieval is not a passive replay but a dynamic, reconstructive process, leading memories to change each time they are retrieved. The "testing effect" suggests that repeated retrieval strengthens memory by enhancing both generalised and episode-specific representations

(Ferreira et al., 2019). However, the effects of repeated testing on the reconstruction of complex, naturalistic images remain largely unexplored. Additionally, most studies on the testing effect have focused on long-term consolidation, leaving the impact of immediate retrieval understudied.

This study investigated how repeated retrieval influences memory representations using a verb-image association task with images from the Natural Scenes Dataset (https://naturalscenesdataset.org/). Functional Magnetic Resonance Imaging (fMRI) data were collected as participants encoded and retrieved 96 verb-image pairs, with each image retrieved four times in random order. During retrieval, participants were presented with a verb and asked to recall the associated image and press a button to indicate their retrieval success. To measure retrieval accuracy more objectively, some retrieval trials were followed by a partially occluded image that participants had to judge as the correct image associated. Behaviourally, "Remember" responses significantly increased between the first and second retrieval, with a gradual increase across repetitions. Recognition accuracy remained high across all trials.

When comparing the overall BOLD signal during encoding with the average of all retrievals, regions along the ventral visual stream and medial temporal lobe, involved in visual processing, memory formation, and higher-order thinking, were more active during encoding than retrieval, whereas retrieval showed greater activity in the cingulum, precuneus, and superior medial frontal gyrus, regions linked to memory retrieval, mental imagery, and cognitive control. The most significant change in BOLD response between the retrievals occurred between the first and second repetition, with the hippocampus, parahippocampal gyrus, fusiform/lingual gyrus, and inferior orbitofrontal cortex showing greater activity during the first retrieval than the second. Conversely, the second retrieval showed greater activity in the inferior temporal gyrus, cingulum, and inferior parietal lobe.

Representational Similarity Analysis (RSA) on item-specific representations revealed a significant linear increase in encoding-retrieval similarity in the medial temporal lobe, and significant variability across retrievals in the medial prefrontal cortex. Additionally, pattern similarity between retrievals showed a significant linear decrease across trials in all regions of interest (ROIs), with the first retrieval more similar to the second than to the fourth. This study offers valuable insights into the mechanisms underlying memory reconstruction, highlighting how repeated retrieval shapes memory representations of naturalistic images.

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Is it too nice to forget? Effect of emotional valence of sources on memory performance in the item-and source-directed forgetting paradigm

Research connecting emotions and memory is focused on how affect aids memory; however, no studies have examined how affect influences the source memory of intentionally forgotten stimuli. Literature on directed forgetting indicates that items presented with a "forget" instruction are recognized worse than intentionally remembered items, however, the effect on source memory is ambiguous. It is important to resolve what the effect of directed forgetting on source memory really is, and whether this effect depends on the affect induced by the context. The main goal of the planned project will be to test whether intentional forgetting of a stimulus and its source depends on the affective characteristics of the context. In the conducted pilot study, we compared the effects observed in the standard item-method directed forgetting paradigm with effects obtained in a source-method directed forgetting where participants are instructed to forget a particular item-source binding. The study was conducted online on a small sample of 30 participants (= 20.5) with four participants rejected due to them not participating in task seriously (final sample: 26 participants). Participants studied a list of 60 neutral words presented on either a positively, neutrally or negatively valanced background picture. For half of the stimuli they were given "remember" instruction, for the other half "forget" instruction. At test, participants were asked to choose whether a word was presented or not in a study phase and with which background picture this word appeared. For data analysis, we used the two-high-threshold source monitoring multinomial processing tree model (Bayen et al., 1996), extended to three sources (Keefe et al., 2002). This model allows to separate contribution of item detection, source discrimination, and guessing to memory test performance. Due to insufficient sample size, the results did not allow for detecting significant differences between model parameters. However, some trends in results preliminary supported some of our hypotheses. First, in accordance with a recent study by Ott, Höhs, and Rummel (2024), in the item-forgetting condition, we found higher source discrimination for remembered to-be-forgotten items than for remembered to-be-remembered items. However, in the source-forgetting

condition, the pattern of results was the opposite with better source discrimination for items with an instruction to remember item-source binding than for items with an instruction to forget this binding. What is more, for to-be-remember items, the source memory parameter was higher for the positive than neutral source, which is consistent with results reported by Symeonidou and Kuhlmann (2024), but source memory for the negative source was not enhanced. In the main project, which will be conducted on an appropriately sized sample, we are going to focus on the interaction effects, that is, whether the effects of remember-forget manipulation vary depending on the emotional valence of sources.

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PS2/27

The impact of Temporal Lobe Epilepsy on autobiographical memory: Reduced specificity and altered spatio-temporal processing

Temporal Lobe Epilepsy (TLE) caused by Limbic Encephalitis (LE) is characterized by inflammation of the fronto-limbic system, resulting in recurrent seizures and cognitive impairments. The hippocampus plays a critical role in autobiographical memory (AM), which involves the encoding, storage, and retrieval of personal life events. In TLE caused by LE, the inflammation and subsequent neuronal damage disrupt these processes, leading to deficits in AM recall. The primary aim was to investigate differences in the richness, specificity, and spatio-temporal structure of recalled episodic events. The current study examined AM recall using the Autobiographical Interview (AI, Levine, 2022) to compare TLE patients to a healthy control (HC) cohort. The participants were instructed to recall and provide a detailed description of events from five life periods. Their responses were scored for episodic and nonepisodic information. We included six patients with TLE, with a mean age of 56 years (ranging from 30 to 75 years) and an average onset at 35 years, alongside seven healthy controls with a mean age of 49 years (ranging from 28 to 69 years). We analyzed our data using non-parametric statistical methods to account for the sample size. TLE patients demonstrated a significant reduction

in the richness and specificity of episodic details. Specifically, they recalled fewer internal details—specifically spatial, and emotional descriptions—when compared to the HCs. This reduction in detailed recollection reflects an inability to retrieve vivid, richly detailed personal memories. In contrast, semantic aspects of AM, such as general personal facts and biographical information, were comparatively less affected. This dissociation suggests that while core semantic knowledge remains relatively intact, the episodic retrieval process is particularly impacted in TLE. To control for potential confounding factors, the analysis adjusted for age and educational differences. After this adjustment, the TLE group consistently performed below HCs on measures of episodic recall. Moreover, the study revealed another critical aspect of memory processing: the temporal extension preceding and/or following detailed recollection. Patients with TLE exhibited a significantly longer temporal extension—the period during which descriptions of events were general or contextual—before initiating/or after ending a detailed episodic recollection. The HC group were quicker to transition from general response initiation to the detailed description of episodic events to finding an end to the episode. This extended temporal elaboration in TLE patients was associated with a reduced proportion of specific episodic details and a greater reliance on abstract, generalized representations of events. In summary, our results support previous findings that TLE negatively impacts the quality of AM, particularly affecting spatial and emotional content. Moreover, we were able to show that this deficit may be compensated by relying on less specific memory representations with broader, extended spatiotemporal features.

Marius Boeltzig, **Nina Liedtke**, **Ricarda I. Schubotz** **PS2/01**

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The benefit of being very wrong: Large prediction errors promote distinctive encoding

Prediction errors are a powerful mechanism for the change of previously encoded memories. When a memory is used to predict upcoming input but fails to do so adequately, a prediction error arises. Previous research has been inconsistent about whether prediction errors lead to forgetting or strengthening of the memory, and there are conflicting accounts of the representational consequences of prediction errors. The Latent Cause Model (Gershman et al., 2017) postulates that strong prediction errors signal a change of underlying circumstances, so that

both the original information on which the misprediction was based, as well as the new and deviant information are valid, but in different situations. After moderate prediction errors however, the pre-existing model is updated to accommodate the new information. As this model is based on computational work and conditioning studies, we tested whether the size of the prediction error had an influence on memory performance and representational outcomes when predictions were based on episodic memories.

In a four-session MRI study, participants listened to a series of naturalistic dialogues, which were presented with slight modifications in a later session in order to induce a prediction error. Prediction error size was measured neurally by tracking the strength of reactivation of the original memory before presentation of the new version, as well as by ratings of similarity between old and new version. Participants were tested on recognition and source memory for both versions.

Larger prediction errors led to high recognition memory for both versions and also increased source memory for the original version. Furthermore, bigger prediction errors led to a stronger reinstatement of the old version while the new version was played, which in turn also led to better memory for both versions. Crucially, larger prediction errors left the original representation more intact, indicating less change in the memory trace.

These results are consistent with a distinctive encoding of the new version after stronger prediction errors. This is in line with the Latent Cause Model (Gershman et al., 2017) suggesting that large prediction errors signal a change of situations, so that old version and new version can both be relevant, but under different circumstances. More moderate prediction errors, on the other hand, led to lower rates of remembering and higher change in the representation of the original, consistent with an updating of the pre-existing model. The results highlight that prediction error size is an important determinant in mnemonic and representational outcomes.

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Layer-specific fMRI of the human hippocampus in autobiographical memory

The human hippocampus has been extensively studied at the macroscale using functional magnetic resonance imaging (fMRI) but the underlying microcircuits at the mesoscale (i.e., at the level of layers) are largely uninvestigated in humans. In this talk, we will present data from recent studies that target three questions fundamental to hippocampal laminar fMRI: How does the venous bias affect the interpretation of hippocampal laminar responses? Is it possible to establish a benchmark laminar fMRI experiment which robustly elicits single-subject hippocampal activation utilizing the most widely applied GRE-BOLD contrast? Can this experiment be replicated and extended using the VASO contrast, which is more specifically tailored to the challenges of layer fMRI? In the first study, we characterized GRE-BOLD responses as a function of cortical depth in individual subfields of the human hippocampus in 8 healthy participants. Our results showed that the vascular architecture differs between subfields, leading to subfield-specific laminar biases of GRE-BOLD responses. Using an autobiographical memory paradigm, we robustly acquired depth-specific BOLD responses in hippocampal subfields. In the CA1 and Subiculum subfields, our results indicate a more pronounced trisynaptic path input rather than dominant direct inputs from entorhinal cortex during autobiographical memory retrieval. In the second study, we used the same autobiographical memory paradigm with a VASO fMRI sequence, which is thought to augment the interpretability of layer-fMRI results by accounting for the draining-vein bias observed in GRE-BOLD sequences. Significant subfields activation patterns were found for autobiographical memory, with layer profiles displaying some inter-individual variability. The overall pattern of BOLD-profiles was consistent with previous reports, showing the feasibility of both GRE-BOLD and VASO-based layer-fMRI in the hippocampus. These two studies provide insights into the hippocampus at the mesoscale level, and builds a foundation for future applications of fMRI to decipher the circuit-level mechanisms of cognitive functions in the hippocampus.

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PS2/31

Affective touch and face recognition: Effects on memory and meta-cognitive performance

Objective

Sensory contexts such as odors or music strongly influence episodic memories. While social interactions often involve tactile information, it remains unclear whether affective touch alters memory for faces. In this study, we investigated whether static and affective touch during encoding impact the recognition of face stimuli.

Methods

We recruited n = 57 healthy adults (40 women , mean age = 27.3±9.5 years,) who viewed neutral faces from the Oslo Face Database while receiving static touch, affective touch, or no touch. During the encoding phase, participants rated the attractiveness and trustworthiness of the faces. Recognition memory was assessed two days later, and participants additionally rated their confidence in their decisions.

Results

We plan to analyze the data using multilevel models. The primary outcome measure of memory performance will be d-prime, a metric that accounts for response bias. As a secondary outcome, meta-cognitive accuracy will be assessed using meta d-prime. Additionally, we will explore the effects of static and affective touch on the perceived attractiveness and trustworthiness of the faces.

Discussion

The findings from this study may offer novel insights into the role of sensory integration in the formation of episodic memories.

Charline Colson, Arnaud D'Argembeau **PS1/02**

University of Liège, Belgium

Temporal compression of real-life events in episodic memory: Predicting compression rates from event features

The continuous flow of information that constitutes daily life events is temporally compressed in episodic memory, so that the time needed to remember an event is generally lower than its actual duration. Recent studies suggest that the rate of event compression during remembering is not constant, but the specific characteristics of events that influence their temporal compression remain poorly understood. In the present study, we used wearable camera technology to investigate how different event features, including duration, familiarity, importance and emotionality, shape their temporal compression in memory. Over three days, participants wore the camera during three distinct daily-life events, each lasting between 30 seconds to 70 minutes. After a delay of 2 to 4 days, participants were asked to mentally replay each recorded event. On each trial, images extracted from the videos representing the beginning and end of the event were presented, and participants had to remember everything that happened between these two moments, in as much detail as possible; the time needed to remember the event was recorded. After their mental replay, participants assessed the subjective quality of their memory and verbally described everything that had come to mind during the mental replay. After completing the memory task, participants rated each event on several dimensions, such as familiarity, importance and emotionality, and provided a retrospective duration estimate. The results showed a significant non-linear relationship between event duration and remembering duration: remembering duration increased as a function of event duration for events lasting up to 10 minutes, beyond which the time required to recall events remained more stable. Beyond event duration, event characteristics significantly influenced remembering duration, with unfamiliar, unpredictable, positive, social and high-change events being less compressed in episodic memory. In addition, both subjective memory quality and objective measures of the amount of detail in memory representations - computed by analyzing verbal narratives using an automated scoring method - were predictive of remembering duration. Finally, retrospective duration estimates were predicted by both event duration and remembering duration. Taken together, these results provide new insights into how the temporal compression of daily-life events is shaped by their intrinsic characteristics.

Ivan Cotumaccio **PS2/18**

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Iconic representations and the function of episodic memory

I argue that episodic memory representations are paradigmatically iconic, therefore any account of the function of episodic memory should explain why that is so. This provides a constraint on the debate on the function of episodic memory. I show how this constraint can help shed light on the debate on the function of episodic memory by applying it to a recent influential proposal by Mahr (2022).

Much interest has been devoted to the claim that episodic memory uses the same neuro-cognitive system as other capacities such as event memory, imagination and counter-factual thinking: the 'scene-construction' mechanism (e.g. Rubin & Umanath 2015), or similarly: 'event-construction', or 'episodic-simulation' mechanism (e.g., Addis 2020). This has been taken by at least some of these theorists to be a central feature of humans' capacity of generating episodic memories. The representations generated by such mechanism have been described by psychologists with a language that indicates iconic representations. For instance, Rubin & Umanath (2015) write: "For a memory to be regarded as "episodic" in nature that memory must have spatial organization. [...] When you attempt to retrieve such a memory, you are probably able to construct a visual image, or at least a sense of the spatial layout" (p. 6, emphasis added). Moreover, such representations are taken to be 'perspectival' (ibid. p. 7), which is a feature that some philosophers take to be central to iconic representations (e.g. Lefke, manuscript. In fact, Lefke argues extensively that episodic memory representations have pictorial content, which is one way to cash out the concept of iconic representations).

If iconicity is central to episodic memory representations, assuming that any account of the function of a given capacity C need to explain the central features of such capacity, then any account of the function of episodic memory should explain why such representations are iconic.

I take this constraint to encompass accounts of both causal and evolutionary functions. Here I apply this constraint to an evolutionary account recently proposed by Mahr (2022). His account has it that episodic memory has the communicative function to grant us epistemic authority on the past. He reaches this conclusion by reasoning from 'form-to-function', where 'form' refers to the structure of the representational content of episodic memories. This is taken to be

about a particular, personal event represented as having actually occurred in the past (2022: 8, 9), but also has a Meta-Representational component that encodes the fact that the memory has been caused by one's own experience. Crucially, the form doesn't involve the iconic component, and the communicative function of grounding authority on the past could be performed just as well by non-iconic, discursive representations that comply with the 'form' specified by Mahr. Hence, such account doesn't account for the iconic nature of episodic memories, and therefore it is at best incomplete as an account of the function of episodic memory.

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PS1/17

How do congenitally and late blind people imagine fictitious events?

For most of us, vivid mental images come easily when we think about our future, personal past, or other fictitious scenarios. These mental images are often in the form of coherent visuospatial scenes. While scene imagery plays a pivotal role in our cognition, helping us navigate through daily life, make decisions, and recall personal memories, its absence or alteration in individuals with visual impairments presents a unique opportunity to better understand its neural underpinnings . We addressed this knowledge gap by examining 16 people who are blind from birth, 18 acquired blindness later in life and 33 matched sighted controls. By comparing their abilities to construct and experience mental scenes with those of sighted individuals, we aimed to uncover the ways in which visual imagery—or the lack thereof—shapes our cognition. We used standard questionnaires, such as the Vividness of Visual Imagery (VVIQ, only visual imagery) and Plymouth Sensory Imagery (PSIQ,multimodal imagery) questionnaire, as well as the gold standard scene construction interview. We found no differences between late blind and sighted controls in any of the PSIQ subcategories and the VVIQ. However, congenital blind people rated lower on the VVIQ than controls and on the PSIQ visual imagery subcategory. Congenitally blind people rated other imagery modality as

high as late blind and controls. The scene construction interview is currently being analysed and will be part of the presentation at the conference. So far, our results indicate that visual imagery is reduced in congenitally blind but not late blind people. This result has important implications for the study of autobiographical memory in these special populations.

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Quantifying the learning dynamics of single subjects in a reversal learning task with change point analysis

A common way of quantifying learning behavior is the estimation of learning rates from subjects' responses. To this end responses are usually averaged across subjects when estimating learning rates for a whole group or averaged over a sliding window when estimating learning rates for single subjects. However, these methods are difficult to apply when the number of experimental subjects and/or the number of trials are too low. Furthermore, the process of averaging obscures the actual dynamics of learning, which can occur within few trials. Indeed, we found that for previous data from a contextual reversal learning task (Uengoer and Lachnit, 2006) that during learning single subjects do not gradually change responses, but appear to abruptly switch their responses. In this task, subjects were shown stimuli, i.e., food items, in either of two contexts, i.e., restaurants, in each trial and had to predict whether the presented item will result in stomach troubles. We analyzed the responses for all stimuli by identifying behavioral change points (CPs)using binary segmentation. Change points during acquisition were biased towards the first two trials and did not differ significantly between stimuli. During reversal CPs shifted towards later trials and were more variable indicating that acquisition memory interfered with reversal. Consistent with these results we found that for data from a follow-up study (Uengoer, Klass et al., 2020) that the backward shift of CPs during reversal is larger when reversal occurs in the same context. These data are not easily accounted for with simple associative learning models such as the Rescorla-Wagner model. Hence, based on previous work (Batsikadze et al., 2022), we used a deep Q-network (DQN) to model the choice behavior of subjects in the reversal learning tasks reported by Uengoer & Lachnit (2006) and Uengoer, Klass et al. (2020), and compared it to a classical Rescorla-Wagner model. Both

models were trained on the experiences of each subject anda simple grid search was used to determine the hyper-parameters, e.g., learning rate, which yielded the best fit. While both models were able to learn the tasks and exhibited a similar CP distribution only the DQN was able to learn context-dependent responses. In summary, we show the importance of analyzing subject-level learning dynamics, show the utility of change point analysis and test the ability of different models to account for learning behavior.

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Bastien Durocher, **Nathan Leroy**, **William Warnier**, **Arnaud D'Argembeau** **PS2/28**

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Accessibility and availability of actions and spatial displacements in memory for real-world events

When recalling the unfolding of real-world events, people do not represent the continuous flow of their previous experience, but rather a succession of key moments, while other moments are omitted. The extent of these omissions depends on the type of events recalled; for example, the course of actions is recalled at a better resolution than spatial displacements. It remains unclear, however, whether omissions in event recall reflect gaps in encoding, or whether the corresponding moments are available in memory but not accessed during retrieval. To address this issue, the present study assessed recognition memory performance for segments that were recalled versus omitted during the mental replay of real-world events involving actions and spatial displacements. Participants went on a tour on their university campus, going to several places and performing different actions while their experience was recorded using eye-tracking glasses. Twenty-four hours later, they freely recalled the events and completed a recognition memory task, discriminating between 5-s video clips from their own tour and those from other participants. We found that segments of experience were less likely to be recalled if they happened during navigation than during more complex actions. This pattern was maintained in the recognition memory task, indicating that moments of navigation have both lower accessibility and lower availability than moments

of goal-directed actions. In a second experiment, we replicated these results and tested whether showing participants their original fixation patterns—overlaid on the video clips during the recognition task—would improve performance, which was not the case. We also found that recognition memory performance was lower for unrecalled moments than for recalled moments but nevertheless above chance, indicating that omissions in the recall of events result from both encoding and retrieval processes. Overall, our results suggest that episodic memory is biased towards the encoding and the retrieval of actions, at the expense of more passive segments of experience. We discuss the specific characteristics of event perception and memory reconstruction that may favor the recall of memory traces related to complex goal-directed activities over that of less active moments like simple navigation, and that could explain the omission of available traces in the recall of real-life events.

Madeline Molly Ely, Géza Gergely Ambrus **PS1/03**

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Temporal neural signatures of facial expression and familiarity processing: A cross-dataset EEG study

Facial emotional expressions play a critical role in social interactions, influencing how we perceive and react to others. Behavioral research on the happy/angry face superiority effect highlights the rapid cognitive processing of emotionally charged facial expressions. This study explores the neural mechanisms underlying these effects by cross-dataset multivariate pattern analysis of EEG data, specifically examining how neural patterns for emotional expressions relate to those of face familiarity. In the first experiment (n=24), participants completed a two-alternative forced-choice task involving happy, angry, sad, and neutral expressions on frontal face images. The second dataset (n=22) investigated neural responses to familiar versus unfamiliar faces. Using time-resolved multivariate cross-classification, we analyzed the temporal dynamics of familiarity-related neural patterns across both datasets. Results revealed that emotional faces, particularly those expressing anger, showed stronger neural familiarity signals compared to neutral faces. These shared familiarity patterns were detectable in both early (200–400 ms) and late (post-400 ms) processing stages. Our findings shed light on the neural dynamics of emotional face processing and its interaction with familiarity, contributing to our understanding of social cognition and memory.

Francesco Fanti Rovetta PS1/07

Ruhr University Bochum, Germany

The self-model in episodic memory construction

Generative theories of episodic memory conceptualize recall not as the recovery of stored information but as the active construction of the remembered episode (Conway & Howe, 2022). According to the scenario construction framework (Cheng, 2024), this process entails the integration of an episodic gist with various sources of information, including information about one's self (i.e., the self-model). The self-model includes information organized in a conceptual representational format (i.e., conceptual self), in a narrative format (i.e., narrative self), as well as perceptual and affective formats (Heine et al., 2024). In addition, during memory construction, only a salient subset of the (long-term) self-model is selected and activated. I call this the situational self-model.

Here, I present previous research on the effect of the self-model on episodic memory retrieval and introduce a novel framework to describe different dimensions along which this influence can be characterized. In particular, it has been argued that narratives are a "tool for establishing coherence" in episodic memories (Dings and Newen, 2023, p. 103), at the expense of accuracy. Generalizing this proposal, I introduce four dimensions (self-coherence; self-valence; self-knowledge; self-control) that are relevant in describing the role of the situational self-model in episodic memory construction. This framework can be employed to characterize patterns of self-to-memory dynamics in specific psychopathological conditions.

Stephanie Michelle Fleming PS1/12

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Stochastic echoes: Variability in phonological recall in bilingual and monolingual speakers

How does linguistic experience shape the stability of memory recall? This study investigates whether bilingualism modulates the consistency of phonological memory by comparing speech reproduction across bilingual (English–Mandarin) and monolingual (English-only) participants. Using a listen-and-repeat paradigm across numerous sessions, participants reproduced four-second audio clips of both

valid English words and pseudowords. Accuracy and precision were quantified using speech embedding models and Dynamic Time Warping to calculate distances between original stimuli and participant responses.

Contrary to the hypothesis that bilingualism stabilises recall through enhanced linguistic experience, bilingual participants exhibited greater variability in both accuracy and precision—not only for pseudowords but also for familiar, semantically meaningful words. These findings suggest that linguistic familiarity (a semantic factor) may not stabilise recall as expected, raising the question of whether phonological memory operates under its own probabilistic constraints, independent of meaning. Monolinguals, by contrast, showed more deterministic recall patterns, with sharper differentiation between familiar and unfamiliar stimuli.

The results offer a behavioural perspective on stochastic vs. deterministic memory processes and suggest that bilinguals may rely on probabilistic encoding strategies that prioritise flexibility over stability. This variability challenges assumptions within traditional memory models that link semantic congruency to recall stability and offers a compelling behavioural complement to current theories on how semantic structure shapes episodic recall.

By showing that increased linguistic experience does not necessarily reduce variability—but may instead reflect a different encoding architecture—this study provides new insight into how bilingualism reconfigures the phonological system, influencing how we store and retrieve verbal information under repeated recall conditions.

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Hippocampal beta rhythms in Alzheimer's disease

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by early impairments in episodic and spatial memory, with hippocampal dysfunction playing a central role in cognitive decline. Neural oscillations, particularly beta rhythms, regulate neuronal activity in the CA1 region of the hippocampus, where place cells encode spatial information crucial for navigation and memory. However, the extent to which beta oscillation deficits contribute to memory im-

pairment in AD remains poorly understood. This study investigates the impact of beta rhythm alterations on CA1 place cell dynamics in APP/PS1 mice, a well-established transgenic model of AD. The relationship between beta oscillations and task performance in a spatial alternation paradigm is examined, as well as the influence of beta rhythms on excitatory-inhibitory interactions within CA1. In vivo electrophysiology is used to record CA1 neuronal activity during a spatial alternation task in a Figure-8 maze, assessing beta power, phase locking of pyramidal neurons, and place cell stability. It is hypothesized that APP/PS1 mice will exhibit decreased beta oscillatory power, impaired neuronal entrainment, and disrupted place cell activity compared to wild-type controls. These alterations may reflect deficits in excitatory-inhibitory balance and impaired network coordination, contributing to spatial memory dysfunction. By elucidating the role of beta rhythms in CA1 and their relationship to spatial encoding, this study aims to provide novel insights into the neural mechanisms underlying cognitive decline in AD. Insights from this research may inform therapeutic strategies aimed at restoring hippocampal function and improving memory deficits in neurodegenerative diseases.

Lyse Gathoye, Christophe Lejeune, Valentine Vanootighem **PS1/18**

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Did it happen or not? Memory narratives may hold the answer

A "nonbelieved memory" (NBM) refers to an autobiographical memory that is no longer believed to represent an event that actually occurred, despite a vivid recollection of the event. More precisely, belief in the occurrence of an event (i.e., autobiographical belief) can be either reduced or suppressed, without losing the ability to remember it (i.e., recollection). NBMs can be categorised into three distinct subtypes – "classic", "weak" and "grain of doubt" – depending on the level of recollection and autobiographical belief. While previous studies have focused on the characteristics of NBMs and those of the people who have them, this study breaks new ground by examining how these memories are reported in comparison to classic autobiographical memories (i.e., BMs, for believed memories). Specifically, we wanted to investigate potential differences between the two types of memory, taking into account the three categories of NBM that can be reported and the type of belief change (reduced or suppressed). To do this, we re-analysed narratives from participants who had described both a NBM and a BM from the same

period of life. The narratives were analysed using the LIWC software, which extracts standard linguistic markers and discursive markers related to psychological processes. In this study, we focused on self-referential, perceptual, contextual and cognitive features, as well as standard linguistic markers in the narratives. We also examined the influence of temporal variables – i.e., distance from event, distance from belief change, and belief duration – on both standard and discursive markers. The results showed that, regardless of the type of NBM reported by participants, NBM and BM narratives differed in terms of length, tenses used, self-referential and cognitive features, but not in terms of perceptual and contextual features. This suggests that changes in autobiographical belief are reflected in narrative content. We then observed that the narratives of NBMs with reduced belief contained more markers of doubt than those of NBMs with suppressed belief and BMs. This suggests that the persistence of even a small degree of belief (in NBM with reduced belief), as well as the absence of doubt when belief is clearly maintained (in BMs) or completely lost (in NBMs with suppressed belief), influences the way people talk about their memories. Finally, temporal variables appeared to have minimal effects on the frequency of linguistic and discursive markers.

Behnam Ghazinouri, Sen Cheng **PS1/25**

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The cost of behavioral flexibility in spatial navigation and spatial learning

To survive in a changing world, animals often need to suppress a previously learnt, but now obsolete, behavior and acquire a new behavior. This process is known as reversal learning (RL). The neural basis of RL in spatial navigation is understudied, leaving its role in behavioral flexibility unclear.

To address this issue, we extended an existing closed-loop simulator of spatial navigation and learning [1], based on spiking neural networks. The activity of place cells and boundary cells were fed as inputs to action selection neurons, which drove the movement of the agent. When the agent reached the goal, behavior was reinforced with spike-timing-dependent plasticity (STDP) coupled with an eligibility trace which marks synaptic connections for future reward-based updates. The modeled RL task had an ABA design, where the goal was switched between two locations A and B after 10 trials. This task touches on two trade-offs: stability vs. plasticity, well known in the neural network literature, and exploitation

vs. exploration, which is central in the reinforcement learning literature. For the RL task, maintaining behavioral flexibility requires exploration and plasticity, but this reduces performance and stability. The challenge is understanding how a biologically plausible spiking neural network maintains flexibility and its associated costs. To measure the agent's performance, we employed three methods: trial duration, proximity, and similarity between the agent's traversed trajectory and an ideal trajectory (DTW). All measurements were consistent.

A combination of symmetric STDP and optimized place field parameters performs well on the first target but lacks flexibility for the second. In three other cases, the agent remains flexible, but incurs different costs. Asymmetric STDP results in highly variable behavior. Using many small place fields leads to low overall performance. Providing an external supervisory signal (injecting noise when unrewarded for too long) results in slow RL and variable performance on the second target, but better performance on the first.

In conclusion, our modeling suggests that intrinsic neural mechanisms may not be sufficient to simultaneously ensure behavioral flexibility, rapid learning, and good performance. A second system might be needed to monitor and intervene in the agent's navigation and learning [2].

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PS1/23

From spontaneous thought to memory: Factors affecting the recall of mind-wandering episodes

Background

The human mind naturally generates spontaneous thoughts, both during tasks and in idle moments. A subset of these experiences, termed mind-wandering, refers to thoughts whose content is unrelated to the task at hand and decoupled from the surrounding environment. A common example is thinking about personal concerns or future events while reading a book or document. While mind-wandering is considered to be mostly disruptive, it can also serve functional roles, such as fostering creativity, problem solving, and future planning. However, for these thoughts to be beneficial, individuals must be able to recall them when needed—for example, when encountering in real life one of the events previously considered during mind-wandering. It remains unclear whether certain characteristics of mind-wandering episodes make them more likely to be subsequently recalled.

Methods

To investigate this question, participants engaged in a Think-Aloud protocol in which they continuously verbalized their thoughts for ten minutes while being recorded. The following day, they completed a surprise free recall task in which they were instructed to retrieve the content of the Think-Aloud experiences they had the previous day. Then, each mind-wandering episode was assessed with a Thought Content Questionnaire, which included scales such as affective valence, importance, and other dimensions. We examined which of these features predicted recall success.

Results

Mind-wandering episodes rated as more important, structured, involving other people, or linked to planning were more likely to be recalled. In contrast, episodes perceived as having no apparent function were more likely to be forgotten.

Conclusions

These findings suggest that specific dimensions of mind-wandering episodes influence their later accessibility during recall. This highlights the adaptive potential of mind-wandering and its role in cognition, offering new insights into how spontaneous thoughts are processed in memory.

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Differences in long-term explicit and implicit memory for tone pattern sequences

Background

Differences between unconscious and conscious memory systems have long been studied, with a demonstrable dissociation between implicit and explicit memory in their decay rates and long-term stability (1,2). These differences have been studied primarily in the visual domain with limited research in audition, particularly using longer stimulus durations (3). Previous work has shown that repeated presentation of arbitrary tone patterns resulted in the formation of robust implicit memory traces that could be retained for 6 months (4). Evidence from electroencephalography (EEG) studies have shown reduced sustained activity in fronto-central brain regions in response to these remembered sequences (vs novel patterns) (5). The present study compared implicit and explicit memory for tone pattern sequences.

Methods

Experiment 1 examined the long-term behavioural effects of implicit and explicit learning of sequential tone patterns. Participants' ability to explicitly learn such patterns was tested using an old/new recognition task while a speeded pattern detection task was employed to examine differences in implicit and explicit memory capabilities, immediately following and 1 week after learning. Experiment 2 compared brain responses to patterns learned implicitly (REGrI) and explicitly (REGrE) using EEG. Participants learned tone pattern sequences in the same manner as experiment 1 – explicit learning was carried out through a recognition task while patterns were learned implicitly using the pattern recognition task. EEG recordings were obtained during passive listening.

Results

Experiment 1 revealed that participants were able to explicitly learn arbitrary tone patterns, which resulted in a significant reaction time advantage (RTA) over novel patterns in the speeded pattern detection test, in a manner similar to that seen with implicitly learned patterns (REGrI). This RTA persisted even after 1 week for both types of learning, although explicit memory showed decay in the recognition test. In experiment 2, a difference in the neural response to REGrI

and REGrE was observed, even when tone pattern sequences were not attended to. A significant difference was present in the sustained response, with increased responses to REGrE compared to REGrI. These differences were largest in fronto-central regions, similar to previous findings. Moreover, performance on the explicit recognition task during learning showed a significant association with the difference in sustained responses at the group level.

Conclusion

The results reveal the capacity of humans to form implicit and explicit memory traces for arbitrary tone frequency patterns, with evidence supporting the distinctiveness of these two forms of learning at a neural level. Future work will be required to better understand the implications of long-term explicit memory decay on the recognition task despite preservation of performance on the pattern detection task. Gaining insight into the long term stability of auditory stimuli compared to other modalities (like visual stimuli) can provide valuable perspectives into the mechanisms underlying auditory perception.

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Abbie Louisa Greenwood **PS1/09**

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Do sleep and prediction error affect the directionality of memory associations?

Memory consolidation is underpinned by sequential activation of newly learned memories called hippocampal replay, occurring during deep sleep and wake conditions. Prediction errors occur when the internal prediction of an event is not met, and may encourage reverse wake replay, due to eliciting a reward-like response. However, following this response, it is unknown whether the memory is stronger in the encoded or reverse sequence order. This study aimed to investigate the effect of prediction error presence on the directionality of memory associations (aim 1) and the effect of the previous night's sleep in this relationship (aim 2). Fifty

participants took part in a 2-session behavioural experiment. Participants were trained on a sequential category structure on day 1, followed by a night of consolidating sleep, before being presented with a short unique sequence that was either consistent with, or violated, the category schema from day 1. Reaction times for answering the 'before' and 'after' questions were assumed to indicate the strength of the backwards vs forward association of memory, respectively. Subjective sleep metrics were recorded for the night between the two sessions, capturing total sleep time, sleep efficiency (Consensus sleep diary) and sleep quality (Groningen Sleep Quality Scale). A linear model was constructed to analyse the effect of predictiveness, direction and each sleep variable on median trial reaction time. There was no statistically significant difference between predictiveness (prediction error/non-prediction error) or direction (forward/backward) conditions for reaction time, and additionally no significant interaction between these two factors. However, it was found that total sleep time had a significant effect on reducing next day reaction time in the task. These findings highlight the need for further work in understanding the influence of prediction error in memory directionality, and the interplay of sleep. Future studies may wish to employ objective physiological measures to capture hippocampal replay, prediction error and objective sleep.

Lucas Gruaz, **Aude Maier**, **Johanni Brea** **PS1/32**

EPFL, Switzerland

A unified benchmark for human-like memory in artificial agents

Human memory exhibits a diverse range of well-documented phenomena, including forgetting curves, interference effects, and schema-based distortions. While existing computational models attempt to capture aspects of these phenomena, they are often evaluated in isolation using task-specific experimental setups, limiting their generalizability and comparability.

We develop a unified benchmark for systematically evaluating memory models based on their ability to reproduce human-like memory phenomena. Our approach includes: (1) analyzing and formalizing a diverse set of memory phenomena in generalizable terms, independent of specific experimental paradigms, and (2) developing an evaluation framework that tests these phenomena within a common environment. This allows to test all phenomena on the same memory-augmented agent.

We test different memory models, such as models from the temporal context model class (TCM/CMR), recurrent neural networks (LSTM), or models of generative episodic memory based on variational autoencoders (VAE), on schema-based distortion, memory conjunction errors, contiguity and recency effects. We find that none of the existing memory models qualitatively matches human memory behavior on all these four phenomena, and we identify promising directions for future research on memory models.

Dingrong Guo, **Yee Lee Shing** **PS2/02**

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Investigating the relationship between schema-based prediction and memory: Preliminary findings from a basketball match prediction task

The Schema-Linked Interactions between the Medial Prefrontal Cortex and Medial Temporal Lobes (SLIMM) model proposes a U-shaped relationship between schema congruency and episodic memory, where both congruent and incongruent events are better remembered than neutral ones (van Kesteren et al., 2012). However, while individual studies support either the congruency or incongruency "arm" of this curve, attempts to validate the full U-shape within a unified paradigm have yielded inconsistent results. These discrepancies may arise from two key factors: First, prior studies often conflate different memory types—such as recognition and associative memory—which may respond differently to schema congruency. Second, many paradigms fail to disentangle schema-relevant content from schema-irrelevant details, obscuring how schema-based prediction selectively modulates distinct memory systems. To address these limitations, we employed a cognitive map training protocol to experimentally establish two-dimensional schemas of basketball teams and used a basketball match prediction task along with various memory tests to dissociate memory types and schema relevance. Our first pilot study found that schema congruency enhanced recognition memory for schema-relevant information, whereas schema incongruency improved associative memory for schema-irrelevant details. In an upcoming second pilot study, we will incorporate basketball match highlight videos as stimuli and examine additional memory types. This research introduces a novel, naturalistic paradigm to investigate how schema-based predictions shape memory, offering a more comprehensive perspective on the SLIMM framework and the broader memory system.

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PS1/28

AMBlind: Resting-state networks of the blind

Our memory is constructed through the recall of multiple sensory experiences, with visual imagery serving as a crucial component. However, for blind individuals, the absence of visual perception may result in a different construction of network connections. Focusing on the hippocampus as a key structure in memory formation, we anticipate that hippocampal connectivity differs among sighted controls (SC), congenitally blind individuals (CB) and those who acquired blindness later in life (LB). Utilizing resting-state functional MRI to measure intrinsic brain activity without external stimuli or tasks, this study delves into the neural networks of sighted and blind individuals to analyze differences in brain connectivity.

This study includes 77 individuals (mean age 54.52 $\pm$ 16.07 years, females: 33) of whom 20 belong to CB and 22 to LB. SC consists of 35 participants. All blind participants required a blindness examination ensuring that the condition resulted from ophthalmological causes, maintaining neurological comparability. We defined CB subjects as individuals who have never perceived significant visual input since birth. The onset of acquired blindness varied among LB participants (mean age of onset: 30.77 $\pm$ 20.34 years), as did the duration of blindness (mean: 29.84 $\pm$ 18.53 years). The MRI imaging data were acquired using a 3T SIEMENS MAGNETOME Skyra scanner. For the anatomical scans, a sequential multi-slice 0.8 mm isotropic whole-brain T1-weighted was employed using a TR= 2.56 s, TE= 1.85 ms, and FoV read = 256 mm. Resting-state imaging was acquired using an interleaved multi-slice 3.5 mm isotropic sequence with TR= 2 s, TE= 30 ms, and FoV read = 224 mm. MRI data pre-processing was performed using CONN connectivity toolbox. The regions of interests (ROIs), including occipital and frontal visual imagery networks, are based on Brainnetome atlas parcellation. Manual segmentation of the Hippocampus mask was performed using the ITK-Snap tool.

LB vs SC: Using bilateral anatomical hippocampal masks as seeds. We found stronger functional connectivity between the hippocampus and the visual-perceptual

cortex (p=0.001) in SC compared to LB. In contrast, LB showed stronger connectivity to the precuneus (p=0.001).

CB vs SC: We found stronger connectivity between the hippocampus and the visual-perceptual cortex (p=0.001) in CB than SC. Moreover, CB showed stronger connectivity between the hippocampus and the left temporal pole (p=0.001).

LB vs CB: We found that CB exhibited stronger connectivity between the hippocampus and the visual-perceptual cortex than LB . In contrast, LB showed stronger connectivity between the hippocampus and the precuneus (p=0.001 for bilateral and right hippocampus, p=0.005 for left hippocampus).

Our findings indicate altered hippocampal connectivity to the visual-perceptual cortex in blind people. While CB show an increased connectivity, LB exhibit decreased connectivity between both brain structures. This dissociation could indicate a functional re-organization of the visual cortex in the CB group which may now facilitate memory processes independent of visual perception, which does not happen for people with acquired blindness. Further analysis will examine the relationship between these differences in connectivity and its relationship to autobiographical memory and scene construction.

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PS1/11

Cognitive flexibility: A behavioral and EEG entropy study on the role of open monitoring meditation

Cognitive flexibility, the ability to switch between alternative ways of processing stimuli and escape from pre-existing thought patterns, is a fundamental cognitive function. It is connected, on one hand, to various mental disorders and, on the other, to key abilities in human evolution and development, such as creativity.

Our study is designed to explore the relationship between training in different meditation practices and cognitive flexibility, assessing both behavioral and neural effects. To assess the behavioral impact, we employ a task-switching paradigm and two word-association tasks involving convergent and divergent thinking, respectively. Behavioral data are complemented by EEG recordings, with a particular focus on entropy-based complexity measures. Building on the Entropic Brain Hypothesis, formulated by Carhart-Harris and colleagues in 2014, we hypothesize that

higher brain entropy may represent a shared neural correlate of cognitive flexibility and the open monitoring component of specific meditation practices, potentially mediating the influence of the latter on the former.

To test these relationships, we compare data from before and after a 4-week training program focused on open monitoring (OM) meditation. The control condition (non-OM training) consists of a comparable program aimed at training focused attention (FA) meditation and body relaxation (BR). The differential psychological effects of these interventions are evaluated using a validated mindfulness questionnaire.

Contrary to our hypothesis, only the non-OM training program led to a significant improvement in the flexibility task. Concurrently, preliminary EEG entropy analysis suggested a state effect enhanced by the non-OM training, manifesting as a decrease in permutation entropy. Nevertheless, the mindfulness questionnaire revealed a significant effect of the OM-centered program only.

While our findings do not support the hypothesized positive link between OM meditation, cognitive flexibility, and increased brain entropy, they suggest that focused attention, rather than open monitoring skills, might play a central role in enhancing performance in our cognitive flexibility task. Furthermore, this study highlights the potential of even a brief OM program in shaping mindfulness-related outcomes. This study is presented as a potential model of a design for implementing short meditation training programs to investigate their behavioral and neurophysiological effects. Further investigation is needed to clarify the relationship between meditation and cognitive flexibility, as well as the potential mediating role of increased brain entropy.

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Image memorability shapes the temporal structure of memory

Image memorability is an intrinsic property of visual stimuli that correlates with the likelihood of an image being remembered. The memorability and the perceived duration of an image are both experiential aspects of stimuli that have recently been shown to be interrelated (Ma et al., 2024). To retain the temporal structure of episodes in memory, detailed information about event sequences—such as tem-

poral distances between items—must be preserved. The general context in which items are embedded acts as a scaffold that aids in the encoding, organization, and retrieval of specific events. Stimulus properties, such as memorability, may also play a crucial role in shaping this temporal structure of episodes in memory. In an online study (n=33), participants actively viewed sequences of either memorable or forgettable images, followed by a judgment of the temporal distance between pairs of images from each sequence using a Visual Analog Scale. Our findings reveal that memorability influences temporal memory: highly memorable images are perceived as temporally closer in memory than forgettable ones. Moreover, shifts in memorability within a sequence (e.g., transitioning from low to high memorability) serve as boundaries, segmenting the sequence into distinct events. These boundaries alter temporal distance judgments for items both within and across these groups, with pairs spanning memorability groups perceived as farther apart compared to pairs within the same group. Our results demonstrate that changes in stimulus properties influencing internal processing, such as memorability, can structure the temporal organization of episodic memory.

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Movies of our minds: Patterns of hippocampal subfields during object, scene, and scenario construction

Episodic scene construction, the process of mentally generating and manipulating spatially coherent scenes, is a critical function of the hippocampus. However, the specific contributions of hippocampal subfields to different forms of construction—object-, scene-, and scenario—remain unclear. Emerging evidence suggests distinct roles for different subfields, highlighting the role of the pre-/parasubiculum in scene-based cognition. Additionally, separate neural circuits within the hippocampus may underlie object-based recognition, spatial scene construction, and the temporal organization of scenarios. Understanding these functional specializations is essential for elucidating the neural mechanisms engaged during visual mental imagery.

Therefore, we instructed 19 healthy young participants (age: 27.89 $\pm$ 3.67 years old, Males: 8) to construct mental visuoperceptual images consisting of

three different types of imagery word cues: 15 objects (e.g., espresso), 15 scenes (e.g., mountain range), and 15 scenarios (e.g., concert). As control task, the participants were to count the number of letters if they perceived the word cue as 15 non-words (e.g., Tribuomnus). The MRI imaging data were acquired using a MAGNETOM 7T Plus ultra-high field scanner, including a 0.6 mm isotropic whole-brain structural T1-weighted scan, three rapid T2-weighted reduced field-of-view scans, and task-based customized rapid whole-brain submillimeter fMRI multishot 3D echo planar imaging (EPI) sequence. MRI data pre-processing was performed using the SPM12. Manual segmentation of bilateral hippocampal subfields (DG/CA4, CA3/2, CA1, subiculum, pre-/parasubiculum, and uncus) was performed on the averaged and denoised T2-weighted structural scans from each participant.

Significant main effects were observed in the hippocampus subfields during all imagery trials in comparison to non-word condition, including object ($F(19,4) = 3.34$, , $p = 0.03$), scene ($F = 7.512$, $df = 4$, $p = 0.0022$), and scenario ($F = 6.453$, $df = 4$, $p = 0.002$) imagery. RM-ANOVA revealed main effects of signal changes in the subfield activations during scenario subtracting scene ($F = 3.335$, $df = 4$, $p = 0.0454$) and scene subtracting object ($F = 8.232$, $df = 4$, $p = 0.0011$). Greater activations were observed in both CA2/3 and pre-/parasubiculum during scene and scenario conditions, while Tukey's multiple-comparison test revealed significant difference of percentage signal change between CA2/3 and the pre-/parasubiculum ($p = 0.0232$), with only a trend between DG/CA4 and the pre-/parasubiculum ($p = 0.0939$). Independent from the activation extracted from the entire hippocampus, only during the scenario construction in the anterior body ($F = 6.453$, $df = 4$, $p = 0.002$) and the posterior body ($F = 6.453$, $df = 4$, $p = 0.002$) displayed main effects of signal change in comparison to the non-word condition. Moreover, signal intensities between different conditions displayed differential activation within the anterior body of the hippocampus. Greater signal intensities were observed in pre-/parasubiculum than CA1 in both scene ($p = 0.0304$) and scenario ($p = 0.0397$) subtracting object trials.

Our findings suggest that the pre-/parasubiculum plays an important role during scene imagery compared to object imagery, while CA2/3 exhibited the strongest activation during scenario imagery, highlighting their engagement in constructing complex mental representations.

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Initial vs. induced prediction errors: Influences on memory stability

A growing body of research suggests that episodic memories not only help recall past experiences but also guide predictions about future events. When these predictions are incorrect, a prediction error (PE) arises, potentially promoting the encoding of new information. Since our predictions of everyday situations can rarely ever be 100 percent accurate, each encoding of a new event should produce a first, initial PE. Individual differences in prior knowledge, experiences, and beliefs likely shape the predictive models people use for novel stimuli, influencing the PEs they experience. Previous studies have created artificial episodic memories and later introduced unexpected stimulus changes to elicit PEs (Boeltzig et al., 2025; Sinclair & Barense, 2019). In this study, we explored whether initial PEs during the first encoding of new material affect memory stability, even when this memory is challenged.

Short, naturalistic dialogues were used as stimuli over the course of a 5-day study (N = 42). In the first session, participants encoded dialogues while undergoing fMRI scanning. Then, they listened to the dialogues again outside the scanner and rated them on five scales that could potentially influence the initial PE: autobiographical association, social consistency, everyday typicality, emotional arousal, and valence. In session two, some dialogues were manipulated to different extents. In session three, the original dialogues were replayed to assess their representational stability after PEs in session two. In session four, a recognition test evaluated memory for both original and manipulated dialogues. Representational similarity analysis (RSA) assessed the reinstatement of the original memory representation right before and after manipulation, while a single-trial analysis was conducted in ROIs generally associated with PEs (IFG, hippocampus, parahippocampal gyrus, SFG and STG) to estimate the initial PE.

A linear mixed model analysis revealed that activation in the IFG, reflecting the generation of a PE, negatively predicted how well the dialogue could be predicted upon next exposure. Recognition of the original dialogue was positively related to single-trial activation in the STG. In a next step, we tested whether the initial PE interacted with the artificially induced PE. A significant interaction effect showed

that especially when the dialogue was poorly reinstated right before the modification, memory for the original benefitted from stronger IFG activation during the presentation of the modification.

Our results show that new events trigger an "initial PE", the strength of which determines the stability of their memory traces. A weaker initial PE led to more reinstatement upon next stimulus exposure, ultimately leading to a more stable representation of the dialogue. Strong initial PEs came with weaker reinstatement, rendering strong induced PE more important for subsequent memory of the original. Future research should consider the development of personalized prediction models to better account for individual differences in PEs.

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Exploring recognition memory for non-semantic visual stimuli

Do existing computational models provide insight into the neural mechanisms underlying episodic memory in humans? This remains an open question, as these models are typically designed to replicate memory behavior without being quantitatively compared to neural data. With the increasing availability of single-cell recordings and functional imaging data from humans performing memory tasks, our goal is to develop a framework to assess the alignment between computational models and neural activity. We believe this approach will help identify the fundamental building blocks of episodic memory and contribute to a unified model of human memory. As a proof of concept, we focus on a visual recognition memory task in which single-cell activity and behavioral responses are recorded while participants watch short video clips, and subsequently determine whether test images were part of the original clips ("seen") or from unseen scenes ("new").

To establish a baseline on this task, we follow a task-driven modeling approach: recurrent neural networks are trained on visual recognition memory tasks with short clips extracted from longer youtube videos, followed by test frames that the model must classify as "seen" or "new." The clips used in the experiment with human participants are not part of the training set. Each clip frame is first processed by a pre-trained ResNet18 for feature extraction. The extracted feature vectors are then passed into a memory module, i.e. different recurrent neural networks for our baseline. The outputs corresponding to the test images of the data sample are fed element-wise into a classifier. The entire model (except the fixed pre-trained

ResNet18) is trained end-to-end using the cross-entropy loss on the classification task. Our experiments reveal that simpler architectures, such as long-short-term memory (LSTM) networks, tend to perform at the chance level, whereas models with multiple blocks of modern state-space models (Mamba2) achieve accuracies comparable to that of human participants.

To compare artificial memory states with neuronal activity, we show the sequences of clips and test images seen by human participants to the trained models, and record the activation levels of the artificial neurons. We use a generalized linear model (GLM), which treats neuronal spike counts as a Poisson process and uses the activations of different layers of the memory model as predictors. By computing a similarity score based on the Poisson regression loss for each neuron across different model layers, we identify which neurons exhibit activation patterns that most closely correspond to specific layers of a given memory model. This analysis not only provides a detailed mapping between model components and neural activity, but also offers an overall measure of how well the inner working of a computational model correlates with the brain's responses during the memory task.

This research establishes a generalizable framework for evaluating computational memory models against neural data. By extending this approach across a broad range of episodic memory tasks, and by testing different computational models of episodic memory, we aim to develop a unified computational model of episodic memory that aligns with neural activity across diverse memory tasks.

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Neural correlates of scene construction in the blind

When we think of fictional scenes like "being on the moon," most of us have a vivid image in our mind, even though we have never actually experienced it. Scene construction (SC) is the ability to mentally create and manipulate detailed spatial environments and is crucial for cognitive functions such as mind wander-

ing, autobiographical memory, decision-making and future thinking. Especially the hippocampus is known to play a central role in visuospatial processing. We investigated how congenital and late blindness differentially affect the neural networks underlying SC, particularly in the absence of visual input.

We hypothesized that sighted controls would exhibit a functional network comprising the hippocampus, visual-perceputal cortices, and ventromedial prefrontal cortex (vmPFC) supporting SC, and that this network would be altered in both blind groups. Furthermore, we investigated whether congenital and late blindness would be associated with decreased hippocampal activation. We further speculated that congenital blindness, due to the reorganization of the visual cortex at an early age, may lead to greater hippocampal activation than in late-blind individuals. Since no data on SC in blind individuals existed, our hypotheses were speculative.

We used functional magnetic resonance imaging (fMRI) with a novel SC task to examine hippocampal activity of a total of 70 participants (Age: $M = 53.91$, $SD = 15.55$; Years of education: $M = 17.36$, $SD = 4.47$; Gender: 39 males, 31 females), including congenitally blind individuals ($N = 19$), late blind individuals ($N = 19$), and sighted controls ($N = 32$). The data were analyzed for differences in neural engagement across the groups.

During SC, sighted controls activated key visual-perceptual and associative regions, including the middle temporal gyrus, fusiform gyrus, angular gyrus, precuneus, and parahippocampus ($p<.001$), as well as the vmPFC ($p<.001$). Furthermore, our findings revealed that all groups engaged the hippocampus during SC ($p<.001$), confirming its essential role in SC regardless of visual experience.

Contrary to our hypothesis, congenitally blind participants displayed increased hippocampal activation during SC than both controls ($p<.01$) and late blind participants ($p<.01$), whereas hippocampal activation was similar for controls and late blind participants. Controls showed increased activation in visual-perceptual regions compared to late blind participants ($p<.01$), and increased activation in sensory-motor regions compared to congenitally blind participants ($p<.01$). Congenitally blind participants showed greater activation in regions related to memory, spatial processing and multisensory integration (precuneus, hippocampus and thalamus ($p<.01$)). We confirmed the key role of visual-perceptual, hippocampal, and medial frontal areas in SC. Late-blind participants relied more on sensory-motor regions, while congenitally blind participants engaged broader spatial and mnemonic networks, reflecting neuroplasticity in the hippocampus and associated networks.

Despite lacking visual experience, they achieved effective SC, suggesting alternative sensory modalities can support scene construction. In contrast, late-blind individuals exhibit a more preserved neural organization, likely due to prior visual exposure.

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Does cognitive neuroscience research on mental imagery need behaviour?

In daily life, we often find ourselves imagining different scenes or scenarios. These experiences of mental imagery are thoroughly first-personal; while you are imagining, no one else can see what's unfolding in your "mind's eye".

This raises the question of whether mental imagery, as a subjective experience, can exist, and therefore be studied, separately from any form of behaviour. There has long been an emphasis on the importance of including behaviour, particularly in cognitive neuroscience studies, which have been criticized for relying solely on neural activity. It has been argued that neural data alone are difficult to interpret, as neural data do not reveal function—that is, the behaviour for which the neural activity is relevant. Moreover, the focus on experience rather than the function of consciousness has been criticized, as it has been argued that experience cannot be separated from function. However, since mental imagery lacks a clear behavioural component, one may wonder whether it serves as a prime example of experience existing without function. If so, this could suggest that integrating behavioural paradigms into cognitive neuroscience studies on mental imagery is not essential.

To explore this possibility, cognitive neuroscience research on mental imagery is first presented. It will then be argued that, although researchers focus on the experience of mental imagery, subtle forms of behavioural measurements are present. However, these measurements primarily aim to capture the experience rather than reveal the function of mental imagery. Instead, a functional account of mental imagery is proposed. Failing to acknowledge the function of mental imagery not only prevents linking its associated neural activity to meaningful, interpretable behaviour but also isolates it from other cognitive processes, such as memory and decision-making. Connections with these cognitive processes are highlighted, and relevant behavioural paradigms are introduced. Finally, the importance of behavioural paradigms in addressing key debates in the field is emphasized.

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Assessing the preferred route of breathing for modulating neural oscillations during human NREM sleep: A pilot study

Episodic memory consolidation is thought to rely on memory reactivation mediated by three cardinal oscillations during the NREM phase of sleep – cortical slow oscillations, thalamo-cortical spindles, and hippocampal sharp wave-ripples [1]. Additionally, breathing has been recently highlighted as a possible pacemaker that helps to organize overall brain oscillatory activity [2, 3]. It has been reported that respiration modulates the emergence of slow oscillations and spindles as well as their interplay, and that the strength of the coupling is linked to the extent of memory reactivation during NREM sleep in humans [3]. But how does respiration coordinate neural activity during sleep? The current dominant hypothesis postulates that the key mechanism is the stimulation of nasal mechanoreceptors by airflow and this periodic receptor activation mediates the widespread breathing-brain synchrony [2]. While this hypothesis is supported by many findings [reviewed in 2], respiratory rhythm generators in the brainstem might also play a crucial role [4]. The goal of this project is to delineate the preferred route of respiration to impact neural activity during sleep in humans.

The presented data are taken from a pilot study, which aimed to assess and improve the overall experimental set-up for a future more comprehensive investigation, which will also include a memory task. The pilot study included 6 participants, 3 with their nose blocked during the night with filled anti-snoring nasal clips and 3 without nose blocking. An EEGo 65 channel EEG system was used to record electroencephalography (EEG) throughout the experiment. Furthermore, electrooculography (EOG) and electrocardiography (ECG) was recorded for polysomnography. Respiration was recorded using an Embla thermistor airflow sensor and a breathing belt.

The main aim of this work is to assess whether nose breathing is indeed crucial for coordinating neural activity. The analysis will investigate the preferred coupling between respiration and sleep oscillations and check the differences in this coupling between the nose-blocked and free-breathing conditions. If nose breathing is key for neural activity synchronization, we should see the organizing effect of respiration on emergence of slow oscillations and spindles severely dampened in the blocked-nose condition.

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The impact of context familiarity on spatio-temporal compression in episodic memory

In our daily life, we experience an immensely rich flow of information that we segment into meaningful events. However, our memory is limited and cannot store all the information related to these events. To enable efficient remembering, our cognitive system must compress the temporal duration and the visuo-spatial details of an event into its gist. A schema representation can then emerge from the statistical regularities encountered between similar events (Sekeres et al., 2018). Although the transition from episodic, context-specific memory to abstract conceptualisation is well established, the impact of these schemas on the creation and retrieval of memories remain unclear.

Recent studies indicate that the contextual familiarity an event takes place in can influence the perceived duration and precision of our memories (Bonasia et al., 2016; Jafarpour & Spiers, 2017). Resource-based theories (Bellana et al., 2021) and construct-based hypotheses of memory (Robin & Moscovitch, 2014) assume that established representations in memory should release resources to be allocated for the encoding of new episodic details while accelerating the recall of the episode. On the other hand, schema-based theories suggest only a robust encoding for the central elements of a scene with a reduced memory for idiosyncratic details (Gilboa & Marlatte, 2017).

Our experiment challenges these hypotheses in an ecological setting by testing the episodic memory of first-year students on a recorded campus tour. In a first session, participants took a walk on the campus during which they visited familiar and unfamiliar buildings. They returned to the lab the next day to undergo an unexpected memory test of their tour. First, we measured the duration they took to mentally relive the visit of each building. Second, we asked them to orally describe the content of their mental replay. Third, they performed a four-alternative forced-choice recognition task where they had to pick images of their tour amongst foils. Finally, they rated familiarity with each building.

We will present preliminary data testing the aforementioned theories, with the prediction that participants will produce more detailed report, better recognition accuracy and shorter replay duration for segments experienced in a familiar place compared to in a less familiar one. Indeed, we expect robust contextual schemas to act as foundations for the creation and recall of the new episodic memories.

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Exploring recognition memory for non-semantic visual stimuli

Statistical learning—extracting the underlying structure of complex environments from ongoing exposure to sensory inputs—is a key mechanism by which humans and other animals acquire generalizable internal representations of the world (i.e., a form of semantic memory). While the kinds of statistical structures that are extracted from stimuli over the course of statistical learning, and the way they generalize to novel test stimuli, have been characterized in great detail, the resulting internal representations have typically been assessed by two-alternative forced-choice tests that simply measure generic familiarity (i.e. memory strength). Hence, it remains unknown how the learning of statistical structure is related to learning, storing, and recalling memories with fine detail and context.

Conversely, recognition memory research has characterized the specificity and context-dependence of memories by using test methods that analyze hit and false-alarm rates of memory judgements through Receiver Operating Characteristic (ROC) curves. Based on these studies, the dual-process theory posits that recognition memory relies on two distinct processes: familiarity and recollection (retrieval of contextual details). However, recognition memory has typically been

studied using stimuli that had strong pre-existing semantic representations (e.g., words, natural scenes), and in particular test stimuli that were either exactly repeated from training or entirely novel Thus, it remains unknown how memories of non-semantic stimuli are recalled and in particular how familiarity and recollection contribute to memory-based generalization.

As a first step toward unifying these fields, we investigated whether the dual-process theory generalizes to memory representations emerging through visual statistical learning. Across six online experiments (each with N=50), participants completed recognition tasks after exposure-based learning requiring different degrees of generalization between familiarization and test. In Experiment 1, participants were familiarized with pairs of simple visual shapes and tested on either the same pairs (targets) or recombined pairs (lures). In Experiment 2, we replaced the shapes in the lures with entirely novel shapes. In Experiment 3, we tested individual familiar shapes against novel shapes, while in Experiment 4, we reversed the structure of Experiment 3 by familiarizing participants with single shapes and testing them on pairs. Experiment 5 involved single-shape familiarization and testing, and Experiment 6 repeated Experiment 1 but with increased

Across these experiments, we found that recollection probability was highest when participants were tested on single items. Conversely, familiarity was stronger when fewer items were presented during familiarization and when novelty contrast was higher at test (e.g., Experiments 2 vs. 1). Prior recognition memory studies suggest that item recognition should engage both recollection and familiarity, while associative recognition (distinguishing true vs. recombined pairs) should rely primarily on recollection. Our results support the joint contribution of recollection and familiarity in experiments with tests based on items. However, in contrast with previous findings, we find that recognition in non-semantic contexts is predominantly driven by familiarity. In addition to this indication of differences in how semantic and non-semantic stimuli engage familiarity and recollection, the present study highlights the paramount influence of contextual factors, such as familiarization-test relations, on recognition performance.

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Unifying episodic memory and spatial coding in a memory-augmented neural network

Recent experimental work in chickadees (Chettih et al., 2024) has found evidence of event-specific hippocampal signals that arise together with spatially tuned activity. This finding reopens the debate on whether the hippocampus focuses on storing and retrieving episodic memories or on coding space, suggesting instead that both processes may be unified. To explore this idea, we simulate an agent in a navigation task inspired by theirs using a memory-augmented neural network trained through reinforcement learning. This network autonomously learns to use a controller to decide where and when to store spatial information in a long-term memory. Analysis of the population vector representation reveals a cognitive map of the environment. At the level of single units, we identify spatially tuned neurons encoding location, goal location, and head orientation, enabling the agent to reach the goal through geometric computation. Also, when an event is stored and later retrieved, we observe a high correlation in the population activity between these events, a relationship that is not present in unrelated events, indicating place-specific memory reactivation. Our model demonstrates that a single system can capture episodic-like events and spatial representations at the same time, offering a computational perspective on how the hippocampus may integrate memory formation and space coding.

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Selective impairment of episodic autobiographical memory in Alzheimer's Disease

Each year the amount of individuals diagnosed with Alzheimer's Disease (AD) continues to rise. As of 2022 the German Alzheimer Foundation found that approximately 1,8 Million people are affected. It is suspected that this figure will increase to 2,8 Million by 2050. A hallmark of AD is a decline in the ability to vividly recall personal past events (episodic autobiographical memory, AM). However, assessing AM deficits remains challenging, as they often manifest gradually

and are difficult to quantify with standard clinical tools. A deeper understanding of these deficits is essential for improving diagnosis and developing targeted interventions.

In this study, we examined 10 patients with biomarker positive AD. The patients were diagnosed with mild cognitive impairment (MCI) or mild dementia. In addition, we tested 10 closely matched healthy controls. We used the gold standard measurement of AM, the Autobiographical Memory Interview (AI). During this interview, participants were asked to recall five distinct memories ranging from their early childhood to a recent event that occurred within the past year with as much detail and vividness as possible. In addition to the standard procedures of examining episodic (internal) and semantic (external) details, we also adapted the protocol to investigate a specific feature, which we named "temporal extension (TE)". TE is a rating of the time interval between the participant's response (starting at a specific time point which lies outside of the specific event) and the point at which they begin describing the specific episodic event.

Confirming previous findings, AD patients reported less internal details than controls with no differences in external details. This effect was visible throughout the life span of the patients, indicating that both recent and remote memories were affected. In addition, one of our new parameters, the TE score showed that patients with AD reported memories with a longer time interval than the controls.

Our results indicate that episodic AM is diminished in early stages of AD and affects remote and recent memories. These findings mesh well with the Multiple Trace Theory (MTT), which, in opposition to traditional consolidation theories, suggests that reliving vivid personal memories depend on hippocampal integrity, regardless of the age of the memory. Furthermore, our results show that other neocortical structures might compensate the deficient AM retrieval by substituting temporal extendedness.

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Recreativism without heterogeneity

The imagination is often regarded as fundamentally heterogeneous. Mental imagery, propositional imagination, creativity are some of the many categories the term often designates. One traditional approach to understanding the imagination

embraces this heterogeneity. It consists of cataloguing sui generis imaginative attitudes and canvassing their respective functional profiles. Recently, a total rejection of this recreativist approach has been pushed by Langland-Hassan. According to his reductionist approach, discourse about imagination can be reformulated in terms of non-imaginative attitudes and imagistic content. This framework eliminates the need for a distinct class of imaginative attitudes. But because this sophisticated reductionism must settle for a one to many mapping between reduced imaginative states and non-imaginative states in the reduction base, it too embraces heterogeneity.

My aim is to fortify the sui generis understanding of the imagination in reaction to the reductionist assault. The crux of this project involves objecting to one of Langland-Hassan's arguments against recreativism: Episodic memories (and, I add, simulations more generally) comprise a kind of occurrent belief involving mental imagery; recreativists view imagery as kind of sui generis, offline attitude; and so, recreativism implies the unsavoury idea that certain occurrent beliefs are also imaginings. One way of understanding the pull of this argument is to see it as revealing a strange consequence of recreativism: some mental states are imaginative in one sense and non-imaginative in another. From here, it is urged that the reductionist taxonomy of the imagination is preferable because it separates imagination as imagery and imagination as a kind of attitude into two merely overlapping classes.

In response to this line of reasoning, I argue that recreativism can be saved by rethinking its central claims. They are the following:

(i) A given psychological attitude type is imaginative just in case it is the functional counterpart of some non-imaginative attitude type . (

ii) is a functional counterpart of just in case its functional profile reproduces that of in an offline fashion, that is, without 's typical outputs and inputs.

This version of recreativism was originally formulated with basic mental attitudes in view, namely, beliefs, desires, sensory experiences, etc. By contrast, episodic memory is a complex mental attitude that incorporates multi-modal sensory imagery, affective states, beliefs, and perhaps even other basic attitudes such as desires and intentions. Therefore, answering the reductionist challenge requires adapting it to explain episodic simulation. My proposal for doing so is to change (i) so that the counterpart relation holds not between attitude types, but between the component processes that combine to generate them. On this view, imagination constitutes a unified capacity, since the counterpart relation applies to underlying cognitive processes rather than to the resulting mental states themselves.

After having sketched my proposal, I show that it is attractive because it is empirically tractable and can serve as the basis of a promising treatment of the (dis)continuism debate in the philosophy of memory, that is the debate about the continuity between episodic memory of the past and episodic imagination of the future.

Emil Eva Rosina **PS1/29**

Ruhr University Bochum, Germany

Experientiality markers in memory reports: A semantics-pragmatics puzzle

Some recent work in semantics and the philosophy of language suggests that the way we report events reflects whether we have personally experienced or witnessed these events (i.e. through linguistic elements dubbed 'experientiality markers'). This paper provides experimental support for one such marker: German non-manner uses of wie ['how']. We argue that when they are embedded under the memory predicates noch wissen ['still know'] and sich erinnern ['REFL-remind'], free relative wie-complements mark the remembering of a personally experienced event. We support this claim through a series of online studies based on scale judgements. The results of our main study raise questions about the semantics-pragmatics interface of the experientiality marking property of wie, and about the robustness of experientiality markers in general. A series of complementary studies address these questions.

Jakub Rudnicki **PS2/19**

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Can a simulationist be a causalist about the metasemantics of episodic remembering?

Recent developments in the empirical sciences of memory have profoundly impacted our understanding of episodic memory—i.e., memory of personally experienced past events—perhaps most significantly by highlighting its constructive character. These insights have prompted a reevaluation of the traditional causal theory of remembering (Martin & Deutscher, 1966), which posits a necessary (appropriate) causal connection between the memory representation of an event and

the original representation formed at the time of the experience. Recently, certain positions in the philosophy of memory, such as simulationism (Michaelian, 2016), have taken observations about the constructive nature of memory to their logical extreme, arguing that such a causal connection need not be viewed as necessary.

One complication arising from this line of thinking is that by rejecting the causal condition, we also seem to lose the most straightforward answer to the metasemantic question (e.g., Openshaw & Michaelian, 2024): What mechanism determines the specific event that a given episodic memory is about?

Or do we? In my talk, I argue that there is an alternative version of the causal story—distinct both from the influential account originating with Martin and Deutscher and from other accounts currently available—that can serve as the metasemantic basis for simulationism. Interestingly, however, this alternative cannot underpin simulationism as a theory of remembering. The key feature of my novel proposal is that it anchors the relevant causal connection not to the perceptual representation, but directly to the remembered event itself, thereby circumventing reliance on the former. This maneuver accommodates simulationism's openness to treating as instances of remembering not only representations whose contents are in no way inherited from perceptual representations of the relevant events, but even representations of events that the remembering subject has not experienced at all. Nevertheless, as previously indicated, this approach cannot serve as a causalist reinterpretation of simulationism as a theory of remembering. The reason for this limitation is simulationism's rejection of factivity—that is, its allowance for genuine remembering of non-occurrent events.

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Neuronal network navigation on designed patterned substrates

Neurons are electrical structures, and their interactions with the physical and electrical properties of the substrates significantly influence their development in vitro. Neuronal growth separately has been studied on PEDOT:PSS - a conductive polymer blend known for its excellent electrical properties and used for in-vivo electrodes, and PVDF-TrFE - a ferroelectric polymer which offers an insulating capacitive surface. Additionally, these substrates offer different surface morphology and different degree of softness. Our study focusses on how the neurons' synaptic networking is affected by the repeatable substrate patterns of these polymers together - which are electrically contrasting environments for the neurons. Design was fabricated in a few hundred microns of width through selective plasma assisted removal (SPAR) etching techniques. Primary cortical neurons were cultured on these patterned substrates and quantitative morphometric analysis was performed via electrophysiology and imaging techniques to assess the neuronal navigation at the interface. The findings from this investigation on interface with biomaterials, will provide a fundamental understanding of primitive developmental memory-on-a-dish at a cellular level, as function of a periodic electrical surface.

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A matter of perspective: the focusing illusion in memory processes, future thinking and empathy

Previous literature suggests constructive processes as a possible common mechanism of memory processes, future thinking and empathy. The focusing illusion may be a useful tool to further investigate these similarities, since in all three cases the focus on single events or circumstances may lead to biased constructions, resulting, for example, in inaccurate estimates of life satisfaction. Therefore, the aim of the present study is to examine whether an induction of the focusing illusion leads to similarly high ratings of life satisfaction in the contexts of memory, future thinking, and empathy. In addition, the role of working memory and personality traits is examined. To this end, 57 participants were asked to imagine different

positive scenarios that randomly concerned either their own past, their own future, or another person. After imagining each scenario, they were asked to rate their own life satisfaction or the life satisfaction of the other person. Participants were also randomly assigned to two groups, with one group experiencing cognitive load during scenario presentation and rating. In addition, various personality traits and current life satisfaction (SWLS) were assessed, with the latter serving as a reference point for realistic life satisfaction within the sample. In all three perspective conditions, imagining the positive scenarios led to ratings that were significantly higher than current life satisfaction. There was no significant difference in ratings for scenarios concerning one's own past and one's own future, whereas ratings for scenarios concerning another person were lower. No effect of cognitive load was found, while the personality traits extraversion (BFI-K) and perspective taking (IRI) were related to higher ratings of life satisfaction. The results suggest that the focusing illusion can influence future thinking and memory processes in a similar way. Thus, excessive focus on individual events or circumstances in one's own past and future could lead to biased estimates of life satisfaction by neglecting both past and future life circumstances that are not in focus. The lower ratings of scenarios concerning another person could be an indication of differences in empathic processes. In explaining this effect, it is important to differentiate between possible differences in episodic construction and possible differences in judgment processes.

Sophie Siestrup[1,2], **Robert Schmidt**[3], **Ricarda I. Schubotz**[1,2] **PS1/13**

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Disentangling the unpredicted: Investigating neural consequences of prediction errors on episodic memory traces using Cloned Hidden Markov Models

When there is mismatch between prediction and experience, a prediction error (PE) arises. PEs do not only allow us to update our internal predictive models, but they can also influence our memories in the process. However, it is still not understood which factors determine when PEs lead to the separation of memory traces (segregation), and when they trigger the modification of existing ones (integration). Cloned Hidden Markov Models (George et al., 2021) suggest that

overlapping experiences can either be represented by first order models, allowing for interference between similar traces, or by higher order models which maintain separate traces for each experience. The latter will happen only when context and outcome differ from the circumstances under which the experience was made previously. In that case, a 'clone' is generated. Based on these theoretical considerations, the upcoming functional Magnetic Resonance Imaging (fMRI) study will investigate the PE conditions under which new events lead to integration or segregation of memory traces on a neural basis.

Participants will encode event sequences (A-C-E) containing three different elements: Contexts (A), episodes (C) and outcomes (E). Contexts will be established as sequences of differently colored silhouettes in which episodes, operationalized as unique silhouettes, will be embedded. Each episode will be followed by a specific target (face or place image) representing the outcome. Throughout the experiment, the participants' task will be to decide for each trial whether an animate or inanimate object is depicted. Next, participants will be presented modified events sequences, triggering PEs. Here, either the context (B-C-E), outcome (A-C-D), episode (A-F-E), or context and outcome (B-C-D) will change. According to the theoretical model, only the latter case should lead to the formation of a clone (i.e., trace segregation), while all other conditions will foster integration. Lastly, participants will be presented all episodes from the encoding and the modification phase again. In the cloning condition, they will additionally see a mix of both versions (A-C-D or B-C-E). We hypothesize that if cloning occurred, such a combined trace should not have been established, leading to PE upon its presentation and thus behavioral consequences, like slower response times.

Importantly, all experimental sessions will take place during fMRI scanning, so that we can test the following hypotheses using representational similarity analysis: If cloning establishes separate traces for A-C-E and B-C-D, C should be predictive of E in context A, while C should be predictive of D in context B. This should lead to anticipatory representational similarity between episodes and upcoming targets in the respective context. When only the target changed, C should lead to anticipatory similarity with both possible targets, due to integration. Furthermore, both cloned C episodes should show less representational similarity to each other than in the non-cloning case where the same episode will be connected to different targets, as in the latter case, the same episode will allow for two alternative outcomes. An important region of interest for these analyses will be hippocampus, which is involved in integration and segregation of memory traces.

Henry Soldan, **Carina Zoellner**, **Charlotte Pechau,**, **Oliver T. Wolf** **PS1/05**

Ruhr University Bochum, Germany

Neural correlates of the impact of semantic structure on temporal sequence memory

During the encoding and recall of temporal event sequences, episodic and semantic memory systems may interact in generating and retrieving a memory representation. As a result, recall of event sequences may not always faithfully reflect the actual temporal event structure, but may be systematically influenced by semantic associations between encoded items. This semantic bias in episodic memory recall would be particularly evident in cases where the two dimensions would imply differential responses. Previous studies have shown such effects in spatial episodic memory and we could demonstrate semantic bias effects in a temporal sequence memory task in our behavioral pilot study. In our current neuroimaging project, we aim to investigate the neural correlates of semantic effects on temporal sequence memory. Specifically, we are interested in whether neural representational patterns at encoding and retrieval of object image sequences can predict memory bias on a trial-by-trial basis. Based on behavioral findings from our pilot study which suggested that the presence of pronounced semantic structure within the encoding set is critical for semantic bias effects on temporal sequence memory, our main focus lies on understanding how semantic context information is encoded and how this is associated with semantically biased memory retrieval. Preliminary results from representational similarity analyses of fMRI data acquired during encoding of image sequences and subsequent temporal sequence memory retrieval will be presented and further possible approaches will be discussed.

Julia Taube[1,2], **Pitshaporn Leelaarporn**[1,2], **Maren Bilzer**[1,2,3], **Cornelia McCormick**[1,2] **PS2/06**

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From single scenes to extended scenarios: The role of the ventromedial prefrontal cortex in the construction of imagery-rich events

Mental events are fundamental to daily cognition, including the recollection of past experiences, the anticipation of future scenarios, and engagement in imaginative, fictitious thought. Typically, these temporally extended mental events unfold within coherent spatial contexts, rich in naturalistic scenes and objects. However, there remains a significant gap in understanding how these events are represented in the brain. This study aimed to investigate the neural patterns involved in the construction of temporally extended mental events. Using functional magnetic resonance imaging (fMRI), we examined brain regions previously implicated in this cognitive process, including the ventromedial prefrontal cortex (vmPFC), hippocampus, and posterior neocortex. We employed a novel experimental paradigm in which participants engaged in three forms of mental imagery: single objects (e.g., "a black espresso"), single scenes (e.g., "a busy café"), and extended scenarios (e.g., "meeting a friend for coffee"). We identified a shared neural network - comprising the vmPFC, hippocampus, and posterior neocortex – engaged across all forms of mental imagery. However, we observed a hierarchical organization in their contributions: the posterior neocortex supported the construction of objects, scenes and scenarios, while the hippocampus primarily contributed to scenes and scenarios. The vmPFC exhibited a stepwise increase in activation, peaking during scenario construction. These findings suggest that the construction of mental events emerges from the close interaction of perceptual details provided by the posterior neocortex, spatial coherence from the hippocampus, and the integration of those elements into a coherent, temporally extended mental event by the vmPFC – the "movies" of the mind.

Volker Tresp, Hang Li PS2/30

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Episodic memories guide behavior

"Rome wasn't built in a day either."

The human brain did not achieve its current level of intelligence in a single evolutionary leap but instead through a series of incremental advancements. For example, the ability to solve complex mathematical and logical problems likely emerged relatively late in evolution.

A fundamental assumption is that perception, semantic memory, and episodic memory form the foundation of any intelligent agent. Recent episodic memories inform an agent about the immediate present, while remote episodic memories provide valuable decision-making support by recalling the outcomes of similar past experiences.

A past episodic memory consists of multiple components: sensory information (e.g., visual input), the agent's internal state (such as pain, thirst, hunger, or well-being), the goal it was pursuing, and the action it performed at the time. Consider an encounter with a bear—if the agent recalls previous experiences with bears and the dangers that followed certain actions, it can use this knowledge to avoid similar risks and make better decisions in the present.

A leading hypothesis suggests that, although the human mind appears capable of thinking about multiple things simultaneously, at a cognitive level, the brain rapidly switches between mental states. This implies that cognitive attention functions as a serial bottleneck in brain processing. A striking example is multitasking—while humans seem to handle multiple tasks at once (e.g., driving while conversing), the brain is actually engaging in rapid task-switching rather than true parallel processing.

Given this, cognitive control plays a crucial role in determining where the brain focuses—on the present, past episodic memories, or anticipated future events. Additionally, cognitive control enables the recall of past episodic events in response to key triggers, helping the agent assess whether a past action improved well-being and satisfaction or had negative consequences. Over time, the agent learns to favor actions that previously led to positive outcomes.

What Determines Which Episodic Memories Are Recalled? The recall of episodic memories is influenced by factors such as sensory similarity, emotional state, and goal alignment. Labels assigned to remote episodic memories help

guide the assessment of similarity and relevance. Over time, cognitive shortcuts develop—if a region of interest (ROI) indicates the presence of a bear, retreating becomes an instinctive response, bypassing the need for active episodic recall.

Episodic memory is not limited to the past—it also extends into the future. Future episodic memory refers to predicted events that are expected to eventually become actual episodic memories. This concept closely aligns with prospective memory in cognitive science.

For example, if an agent knows there will be a football game in town tonight and that the weather will be bad, it can form a future episodic memory labeled "bad traffic." By comparing this future episodic memory with past experiences, the agent can anticipate potential congestion and make an informed decision—perhaps choosing to stay home. This process of imagining future scenarios based on past experiences exemplifies grounded and embodied cognition.

Valentine Vanootighem **PS1/15**

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New evidence for the similarity between believed and nonbelieved memories from the fading affect bias

The phenomenon whereby people remember events that they know never happened is called "nonbelieved memory" (NBM). It reflects a dissociation in autobiographical memory between two distinct components: recollection and autobiographical belief (or belief in occurrence). Several studies have investigated the characteristics of NBMs by comparing them with typical (i.e. believed) memories (BMs). Although some phenomenological differences have been observed, NBMs are often experienced as "memory-like" despite the change in belief. The first aim of this study was to examine whether the characteristics of NBMs are influenced by the emotional valence of the events, as has already been shown for typical memories. A second aim was to examine whether emotional valence and intensity ratings follow similar patterns over time for both types of memory. To this end, 220 participants aged between 20 and 60 were asked to describe a personal NBM, explain the reason for their change in belief, and rate its phenomenological characteristics (e.g., sensory and contextual details). When an NBM was retrieved, participants also described an age-matched BM of the same valence, so that the characteristics of both types of memory could be directly compared. Consistent with previous findings, NBMs and BMs were rated similarly on certain

phenomenological characteristics, such as the spatial arrangement of objects and people within the memory. Differences emerged for other features, particularly auditory and temporal details, which were reported more vividly for BMs than for NBMs. We found that phenomenological ratings of both NBMs and BMs were only minimally influenced by emotional valence. However, an analysis of emotional valence and intensity ratings at the time of the event and during retrieval revealed that the fading affect bias (FAB), whereby negative emotions fade faster over time than positive ones, was evident for both NBMs and BMs. As the FAB is well established for typical memories, these findings demonstrate the robustness of this bias, showing that it holds even for events that individuals no longer consider part of their personal past. Our results thus support the idea that NBMs and BMs resemble each other despite differences in belief.

Dominika Varga[1], **Petar Raykov**[2], **Beth Jefferies**[3], **Aya Ben-Yakov**[4], **Itamar Ronen**[1], **Chris Bird**[1] **PS1/14**

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Hippocampal prediction errors arise from episodic memories, and not generalised knowledge-based expectations

Prediction errors drive learning by signalling mismatches between expectations and reality, but the neural systems supporting these computations remain debated. The hippocampus is implicated in mismatch detection, yet it is unclear what prior contextual knowledge it uses to generate expectations. Using functional MRI (fMRI) and functional Magnetic Resonance Spectroscopy (fMRS), we investigated whether the human hippocampus bases its expectations on episodic memory or generalized world knowledge, and what the neurochemical basis of the hippocampal mismatch signal is. Across three fMRI experiments using video clips of everyday situations, we show that the hippocampus is selectively engaged by mismatches with episodic memories of specific events. In contrast, mismatches with generalized knowledge activate the Semantic Control and Multiple Demand Networks, alongside subcortical regions involved in prediction error signaling. Notably, episodic mismatches also recruit the Default Mode Network. Furthermore, fMRS revealed that episodic mismatch detection is accompanied by an increase in hippocampal glutamate concentration, the brain's primary excitatory neurotransmitter which plays a key role in plasticity in learning and memory. These findings

challenge accounts that propose the hippocampus is a domain-general mismatch detector. Instead, the findings support a specialized role in learning via episodic memory-guided predictions, and provide a neurochemical basis for this process.

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The effect of dopamine on replay events in a hippocampal spiking network model

The network of place cells in the hippocampus exhibits sequential activity patterns during wakeful rest or sleep, accompanied by sharp-wave ripples in the local field potential. These sequences can reflect previously experienced trajectories in forward or reverse direction ("replay"), but also possible future or entirely novel trajectories. The heterogeneity of the sequential activity suggests that the underlying mechanisms are flexible, consistent with the idea that hippocampal activity is related to episodic memory traces. We hypothesize that neuromodulation plays a key role in this flexibility by adapting hippocampal networks, e.g., to the motivational, attentional, or emotional state of the animal. Here we focus on the complex effects of dopamine neuromodulation on hippocampal synaptic plasticity, and examine how different levels of dopamine during the storage of spatial trajectories shape their reactivation, as a potential mechanism underlying adaptive memory traces.

We expand on a data-driven spiking neural network of the CA3 region (Ecker et al., 2022, Elife, 11, e71850) to investigate the impact of dopamine on replay dynamics. We examine the effect of several types of dopamine-dependent meta-plasticity of symmetric spike-timing-dependent plasticity (STDP) curves during the simulated spatial trajectories. For the first type of meta-plasticity, high dopamine leads to an overall symmetric increase in the synaptic weight changes. For the second type, based on experimental findings on dopamine meta-plasticity in the hippocampus, high dopamine selectively enhances the positive weight changes for pre-before-post spike pairs. To quantify the model output, we assess how different dopamine levels affect replay using several measures: (1) the frequency of replay events, (2) the length and the sections of the replayed path, (3) the accuracy of the replayed sequence, and (4) the balance between forward and reverse replay.

We found that dopamine meta-plasticity strongly affects several properties of

replay. For symmetric increases in weight changes, we observed a higher frequency of replay events and longer replayed paths, in line with the stronger synaptic connections. For selective pre-before-post STDP changes, forward replay occurred more frequently, and replayed sequences were again longer compared to the baseline. These results suggest that high dopamine enhances replay frequency and prolongates replayed paths, especially for forward replay by stabilizing synaptic connections that reinforce previously experienced sequences. However, we also observed that changes in STDP can easily lead to excessive replay activity with overall heightened network activity, requiring additional adaptation of the inhibitory population to maintain network stability.

We conclude that dopamine meta-plasticity significantly influences replay dynamics, supporting a key role of hippocampal dopamine neuromodulation in adaptive memory to prioritize and stabilize relevant memory traces.

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Does a shift in mental time translate into a shift in low-frequency oscillations?

Through mental time travel (MTT), humans can explore past events or possible futures. One hypothesis is that MTT builds on flexible temporal cognitive maps of events' position in time (Gauthier & van Wassenhove, 2016). Previous studies have shown the implication of the hippocampal-entorhinal system for MTT (Gauthier et al., 2019; 2020), where the sequential firing of neuronal assemblies on shifting phases of theta oscillations codes for spatial position and distance (Dragoi & Buzsáki, 2006). Yet, the computation of temporal distances remains to be characterized. In a novel paradigm (N = 63), participants mentally projected themselves to different dates in the past or future. They were shown historical events, and had to report whether the event would happen before or after, with respect to their temporal position. The further away in time participants imagined themselves to be, the slower their reaction times. This behavioural parametric shift shows that distance computations can be captured during MTT, and grounds the hypothesis of a similar shift in neural responses. Herein, we adapted this task to magnetoencephalography (N = 31). We show that the amplitude of neural responses evoked by mentally projecting in time increased compared to being in the present, but did not shift along distance. This suggests that the

evoked response captures the operation of mentally projecting oneself, but not the underlying distance computations. Analyses are ongoing to test whether the phase of low-frequency oscillations shifts with the distance of projection, which would provide evidence that temporal distance computations can be implemented by low-frequency neural dynamics.

Ullrich Wagner, Gerald Echterhoff **PS2/15**

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Audience attitude effects on communicators' memory: The role of the communicator's own initial judgment

In the „saying-is-believing"(SIB) effect (Higgins & Rholes, 1978; Echterhoff et al., 2005), episodic memory retrieval of a communicator is biased in the service of shared reality creation with his/her audience. Specifically, memory of behaviors of a target person is evaluatively biased in the direction of a communication partner (audience) who allegedly likes or dislikes the target person. The extent of this memory bias (audience attitude effect = SIB effect) depends on the degree of the communicator's epistemic trust in and perceived shared reality with the audience and is cognitively grounded in enhanced accessibility of audience-congruent target information (Wagner et al., 2024). Here, we present data from a series of new experiments investigating in how far the effect depends on the communicator's own initial judgment about the target person (OJ). Across studies, results indicate that the SIB effect does not essentially depend on OJ. Overall, recall valence was predominantly determined by OJ, but it was still additionally adjusted, depending on whether the audience's attitude was positive or negative. The extent of this adjustment (SIB effect) was comparable when the communicator's initial judgment was positive, negative, or neutral. Parallel results were obtained for accessibility measures (Wagner et al., 2024). In several studies, we additionally examined the role of participants' confidence in OJ. Communicators' self-reported confidence was overall remarkably high and difficult to be modified by experimental manipulations. However, audience attitude effects were attenuated with a manipulation encouraging participants in their own view by openly suggesting a norm of high confidence.

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Mental imagery deficits in aphantasia: Effects on autobiographical memory and directive function

Background Study

Autobiographical memory (AM) enables us to relive personal experiences and is highly dependent on visual imagery. AM has three main functions: identity (our experiences build our identity, a sense of coherence and continuity of self), directive (our experiences guide our behavior to adapt to future scenarios), and social (creating and maintaining close social bonds). Individuals with aphantasia, characterized by deficits in mental imagery, often report reduced AM. However, no studies have investigated whether this reduction in AM impacts identity, directive, or social use.

Participants and method

Forty-three participants were recruited online via Limesurvey (23 participants with Aphantasia and 20 age- and education-matched controls). Participants completed the Vividness of Visual Imagery Questionnaire (VVIQ), a 16-item scale that asks participants to imagine a person in several scenes and rate the vividness of these mental images using a 5-point scale. The Thinking About Life Experiences (TALE) scale was also used (15 items on a 5-point Likert-type scale). This scale assesses the frequency with which people recall or talk about their past experiences and the three main functions of AM. Participants also completed the Autobiographical Recollection Test (ART, a 21-item self-report questionnaire on a 7-point Likert-type scale), exploring the subjective quality people attribute to their AM on different dimensions (vividness, narrative coherence, reliving, rehearsal, visual imagery, scene, and life-story relevance), and the Survey of Autobiographical Memory

(SAM, a 26-item self-report questionnaire on a 5-point Likert-type scale), allowing to examine the past episodic, future episodic, and semantic items of memory.

Results

We confirm a significant difference in the VVIQ with lower vividness of mental images in the Aphantasia group compared to the control group. Our study revealed a lower directive function of AM in the Aphantasia group but no difference between groups for identity and social functions. Additionally, the Aphantasia group scored lower than the control group on each ART dimension. Scores for past and future episodic memory were also lower in the Aphantasia group than in the non-aphantasic group, although the semantic memory scores were similar between both groups.

Discussion/Conclusion

Our study confirms the absence of mental imagery in individuals with Aphantasia and the resulting differences in AM. In line with previous research, we emphasize the increased difficulty in recalling past events and imagining future events, with significant differences in the proprieties of how they recall personal events. For the first time, we suggest that this lack of mental imagery may impact AM's directive function. The absence of mental imagery seems to reduce the detail in episodic memories, which may affect the ability to reinvest past experiences for problem-solving or decision-making. Interestingly, these challenges do not appear to interfere with semantic memory, identity, and social functions. This finding adds a new dimension to our understanding of the impact of visual imagery on memory.

Louisa Warzog **PS2/03**

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The role of sleep in the consolidation and contextual generalization of fear extinction memories

The process of memory consolidation during sleep is a multifaceted and dynamic field of study characterized by diverse and sometimes conflicting research outcomes. Fear and fear extinction memories do not constitute an exception: The precise role of sleep, including the different sleep stages, in the consolidation of fear and fear extinction memories is only partially understood. Exploring the impact of sleep on fear and fear extinction memory consolidation could, however, enhance

the effectiveness of exposure therapy and offer valuable insights into the etiology and progression of fear-related psychiatric disorders. The thesis at hand thus aimed to contribute to a better understanding of the role of different sleep metrics such as sleep duration, slow wave sleep (SWS) amount, REM sleep amount, light sleep amount, and overall sleep quality in the consolidation and contextual generalization of fear extinction memories. In the presented study, 25 healthy participants underwent a two-day laboratory-based fear extinction paradigm (adapted from Milad et al. 2007), with their sleep patterns monitored using actigraphy during the night between experimental sessions. Fear acquisition and extinction training occurred on day 1, followed by retrieval, reinstatement, and reinstatement testing on day 2. Overall, a decrease in general fear responding towards conditioned stimuli (CSs), as measured by skin-conductance responses (SCRs), was observed during fear acquisition and extinction on day 1 across all CSs. A notable distinction between responses towards reinforced stimuli and unreinforced stimulus emerged on day 2 during the first retrieval trial, indicating the consolidation of fear memories between experimental sessions. We thus found evidence of fear, but not of extinction memory consolidation between experimental sessions, rendering it challenging to directly assess sleep's role in extinction memory consolidation and generalization. Neither did sleep show a clearly identifiable impact on fear memory consolidation, indicating that fear memory was consolidated independently of sleep. Further research with larger sample sizes is essential to gain a deeper understanding of how sleep influences the consolidation and generalization of fear extinction memories.

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Are eye movements during sleep linked to memory consolidation? – The first attempt

Sleep plays an important role for memory consolidation. While we sleep, new information we acquired during the day is not simply protected against interference but also actively strengthened. Through reactivation, i.e., the reoccurrence of neural patterns observed during learning, the information is transferred from the hippocampus to the neocortex, which ensures the content to be stored in long-term memory. Coordinated reactivation during sleep is enabled by oscillations,

i.e., sleep spindles and slow oscillations (SOs), and their simultaneous occurrence.

Interestingly, during wakefulness reactivation is accompanied by eye movements. Learning-related eye movements during wakefulness reoccur when memories are correctly remembered, and suppressing eye movements during memory retrieval leads to a reduced memory performance. Here, we set out to test whether learning-related eye movements also occur during sleep, when reactivation is supposed to takes place. Since reactivation during sleep has been shown locked to sleep spindles and SO-spindle events (i.e., during non-rapid eye movement, non-REM sleep), we will investigate eye movements during these events. Since memory reactivation has been shown to also happen during rapid eye movement (REM) sleep, we will further test for learning-dependent eye movements during REM sleep.

Electrooculography (EOG) and electroencephalography (EEG) data from two sleep studies are analysed. In both studies participants had to memorize different objects. However, while in the first study all objects were centrally presented, in the second study all objects were presented at different spatial positions. Thus, participants of the first study are expected to show a reduced amount of large eye movements during learning. In both studies, participants had to remember the objects directly after learning as well as 2 hours later. During these 2 hours, participants took a nap. Eye movements were measured based on the EOG signal during learning and during sleep. However, detecting eye movements especially during sleep presents methodological challenges, as the eyes remain closed and eye movements during non-REM sleep are, if present at all, diminished. Here, we will build up on previously used methods to detect eye movements during REM sleep and apply them to both, REM and non-REM sleep. Although eye movements during non-REM sleep are rare, we test whether the detected eye movements are clustered around spindle and SO-spindle events. Further, we compare both studies regarding the amount of eye movements during non-REM and REM sleep. With this, we want to test for a modulation of eye movements during sleep as a function of eye movements during learning potentially signifying a reinstatement of learning-related eye movements during post-learning sleep.

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exploring the neural and phenomenological landscapes of self-incongruent autobiographical memories

Autobiographical memory recall is strongly influenced by the integration of past experiences with the self-model, ensuring that the recall of one's past is congruent with a stable and positive self. However, self-incongruent memories—particularly those associated with shame—pose a challenge to this integration, often leading to changes e.g. in recall perspective, emotional intensity, or semantic structure. Our recent diary study demonstrated that self-incongruent memories systematically alter recall perspective and other phenomenological characteristics. Our ongoing work has further explored these processes through multiple approaches. First, we developed a new theoretical framework to outline the role of different access routes—phenomenological, semantic, and neural—for the investigation of self-memory integration. Second, we conducted a laboratory study to induce shame through public singing, allowing us to examine its effects on phenomenological and semantic memory-markers in more detail.

While our previous and ongoing behavioural studies have focused on the phenomenological and semantic access routes, the next step is to explore how these processes manifest on a neural level. The fMRI approach allows us to investigate the impact of shame on self-memory integration using the neural access route, providing insight into the underlying mechanisms that shape self-incongruent memory integration.

Building on our previous research, we developed an fMRI paradigm that focuses on the recall of subject-specific autobiographical episodes evoking shame, alongside episodes associated with contentment, fear, and pride. In addition to fMRI, a comprehensive set of phenomenal measures will be collected to gain deeper insight into the content and subjective structure of these memories. These measures include free verbal recall with simultaneous recording of physiological data (cheek temperature, heart rate, and galvanic skin response), ratings on multiple emotional dimensions—including valence and arousal scales—and the Memory Experience Questionnaire (MEQ), as well as similarity assessments with free sort task and explicit similarity judgments between pairs of episodes.

Our goal is to identify the neural correlates of self-incongruent memories. We will compare the fMRI activation patterns associated with memory recall and

the phenomenal measures using multivariate methods (representational similarity analysis, RSA). By incorporating neural, phenomenological, and semantic access routes, this study directly builds on our theoretical framework outlining their role in self-memory integration.

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Modeling and manipulating the primacy effect: Evidence for contextual control during free recall

Experimental psychologists study the organization of episodic memory using "free recall" of lists of words. Free recall data demonstrates complex temporal organization, with participants showing better recall for later list items ("recency") but also for the earliest list items ("primacy"). In addition, participants tend to sequentially recall items that were encoded in nearby list positions, and tend to prefer forward over backward transitions. This complexity is captured by the "context maintenance and retrieval" (CMR) model, a powerful connectionist model of the episodic memory system. CMR maintains a persistent contextual representation that drifts over time, slowly integrating each moment of experience into the context. This contextual representation then acquires bidirectional associations with new incoming experiences, so that later similar contexts can function to retrieve these experiences, and retrieved experiences can aid to reinstate the context in which they were experienced.

CMR is typically fit to empirical data using heuristic methods that optimize summary statistics and average recall rates. We instead implemented a version of CMR in the software Stan, that estimates the parameters in a hierarchical Bayesian framework based directly on the recall responses and their order, rather than a set of summary statistics. Considering an immediate free recall dataset that tested both young and older adults (Healey & Kahana, 2016), we observed that this implementation of CMR does not predict a strong primacy effect, unlike heuristic fits of CMR. However, heuristic fits predict that participants immediately recall the early list items, whereas participants tend to "jump" to these items only after recalling the latest list items. We attempted to address this limitation by turning CMR into a mixture model where participants only show a primacy effect on a subset of trials, and this primacy effect is mediated by top-down changes of the

context to resemble the context as it was before the first word was encoded. This top-down control over context could be interpreted as the result of the construction of a "memory palace" (Zhang et al., 2023) which can be re-entered at will. Fits of this model reveal that older adults struggle with reinstating the start-of-list context, as well as with prioritizing backward transitions on trials where they were not able to retrieve the start of the list.

Further addressing the contextual control explanation of the primacy effect, we ran a novel experiment in which participants received rewards for a subset of the items they encoded. Participants saw lists of 20 words, each word preceded by a reward cue. Either words 5-12 or words 13-20 could be rewarded on a list, and the reward was given either immediately during the encoding, or contingent upon later recall. For the recall-rewarded words, we observed a strong mid-list primacy effect, suggesting that participants formed a separate memory palace for these words.

References:

Healey, M. K., & Kahana, M. J. (2016). A four-component model of age-related memory change. Psychological review, 123(1), 23.

Zhang, Q., Griffiths, T. L., & Norman, K. A. (2023). Optimal policies for free recall. Psychological Review, 130(4), 1104.

Carina Zoellner, Henry Soldan, Leonie van Well, Romy Skolik, Lana Giesen, Oliver T. Wolf, Sabine Seehagen **PS1/01**

Ruhr University Bochum

Investigation of the interaction between semantic information and episodic memory traces in primary school children

Recent studies showed that both children and adults made use of semantic information in cases of erroneous episodic memory retrieval (Sipe & Pathman, 2021; Zöllner et al., 2022). The current study elucidates the role of age in this process and further investigates how children use pre-existing knowledge in constructive episodic memory retrieval. Age as a moderator of the interaction between episodic memory traces and semantic information during retrieval is of interest from a developmental perspective, as children from different age groups are likely in different stages in the development of semantic knowledge. Younger children's knowledge

is based on fewer previous experiences, and their semantic networks are less established. Accordingly, false memories, based on prior knowledge, were more likely to occur in older as compared to younger children in the Deese-Roediger McDermott paradigm (Dewhurst & Robinson, 2004). In the current preregistered study, children belonging to two age groups (6-7 years vs. 9-10 years, $N = 99$) performed a series of actions with common household objects in a virtual environment. Some objects were encountered at an expected, congruent location, and others at unexpected, incongruent locations. In ongoing analyses, we are specifically looking at the retrieval pattern of incongruent objects, that is, how episodic memory traces and semantic information influenced the respective retrieval: was an object retrieved correctly, hence according to the episodic memory trace, and if not, rather placed in the semantically fitting or in an unrelated room? Thus, we compare the response pattern in spatial retrieval of differently aged children when there is competition between episodic memory traces and semantic information.

WHERE TO FIND THINGS

Food
Cafés
Office supplies
Printing
Meditation

5 INFORMATION

FOOD

1. MENSA (€)
The "Mensa" is the university's main cafeteria. It offers a diverse range of meals including vegan, vegetarian, and halal options. You can chow down on traditional currywurst with fries, go healthy at the salad bar, or fill up on carbs at the pasta bar. We recommend trying it out at least once during your stay.

Location: Directly above the conference center - Level 02
Payment: Plastic only
Opening hours: M-F 11:00 - 14:30

2. A_KAFFEE (€)
Above the "Mensa" is the AKAFFEE. It offers hot drinks, sandwiches, waffles, muffins etc.
It's a good place for a light snack if you don't feel like having a full meal or if you are craving something sweet after lunch. Vegan milk alternatives are available.

Location: Directly above the conference center - Level 01
Payment: Plastic only
Opening hours: M.-Th. 08:00-16:00, F. 08:00-15:00

3. ROTE BETE (€€)
The "Rote Bete" is RUB's vegan cafeteria. It offers new dishes daily. Pile your plate wisely—buffet bites are priced by weight! But don't worry, the dish of the day comes with a fixed price tag. Terrace seating is available.

Location: Directly above the Mensa - Level 01
Payment: Plastic only
Opening hours: M-F 11:00-14:30

4. Q-WEST (€€)
Q-West is situated to the west of the main square and is 350 m walk from the conference center. It has outdoor seating and offers dishes such as pizza, pasta and stir fry. If you are lucky you may find that the grill hut is open! The bar's barista can whip you up your coffee fix, which is great to wash down their tempting German-style cakes.

Location: West of the main square
Payment: Plastic only
Opening hours: M-F Lunch 11:30-14:30; Coffee 14:30-18:00; Snacks 15:00-17:30; Dinner 18:00-21:30

OTHER CAFES:

KULTUR CAFE (€)
Grab a sandwich and relax in a pub-like setting. Meet up after the conference for a beer, a shot or a cup of steaming hot chocolate.

Location: Well hidden! Building SH (see Google map)
Payment: Cash only
Opening hours: M-Th. 10:00-20:00, F 11:00-16:00

EDWARDS (€)
A traditional cafe in the university library.
Rumored to have the best
coffee on campus.

Location: Main library - ground floor
Payment: Plastic only
Opening hours: M-F 09:00 - 17:00

OFFICE SUPPLIES

Yes, we know that feeling! You arrive at your destination only to realise all the things you forgot to pack. Luckily there are a couple of places nearby where you can stock up on those famous German office supplies.

CAMPUS CENTER:
Step into the campus center, which is a building very uncharacteristic for the RUB. It is in front of building GA, between the Mensa and Q-West. It houses a few small shops including a traditional Kiosk, where you can buy cold drinks, snacks, magazines, beer, tobacco etc., an old-fashioned record store in case you are looking to expand your LP collection, a cell phone store (a local SIM anybody?), and the ever-important office supply store.

Location: RUB
Payment: Cash or credit
Opening hours: M-F 09:00 - 17:00

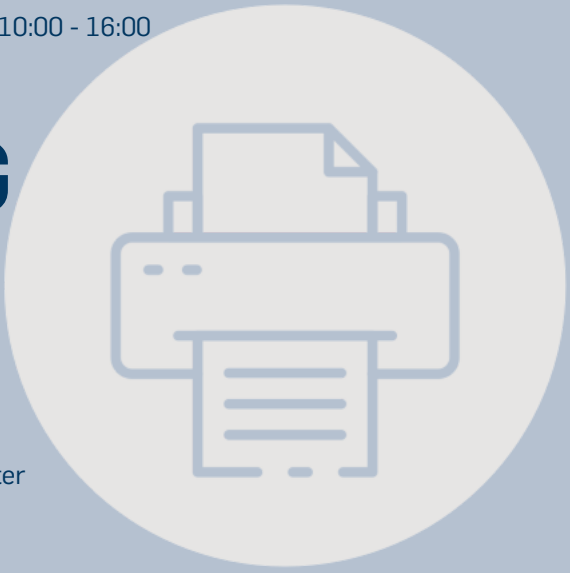
UNI CENTER:
After alighting from the U35 and climbing the stairs, turn left instead of right and you will be in a small shopping center. There are two stationery stores here: Mc-Paper and Druckhaus Bochum.

Location: Querenburger Höhe 220, 44801 Bochum
Payment: Cash or credit
Opening hours: M-F 9:00 - 19:00 / Sa 10:00 - 19:00

DOWN TOWN:
Tintenfass is a cute locally owned stationary store a stone's throw from the Bochum main train station.

Location: Huestraße 12, 44787 Bochum
Payment: Cash or credit
Opening hours: M-F 10:00 - 18:00 / Sa 10:00 - 16:00

PRINTING



COPYSHOP CAMPUS:
Privately owned. Two locations.
They claim to be able to print all sizes.

Location: Uni Center and Campus Center
Payment: Cash or EC card
Opening hours: M-F 09:00 - 17:00

RUB COPY CENTER:
This is the university's official copy shop. It offers high-quality printing at reasonable prices. Note that they may need 24 hours to print a poster, but you can also send it to them by email (druckzentrum@rub.de).

Location: Bottom floor of building SSC (SSC 01/219)
Payment: Cash or EC card
Opening hours: M-W 08:00 - 16:30 / Th-F 08:00 - 15:00

MEDITATION

Do you need a quiet place to meditate, pray, or just take a few moments for yourself? Try out the Ruhr University's new addition "Raum der Stille" (room of silence). It is conveniently located in the same building as the conference center. Just take the elevator up to level 01 and find it across from the Rote Beete. Please check out the list of dos and don'ts at:
`https://einrichtungen.ruhr-uni-bochum.de/en/room-silence`

Location: Mensa building, level 01
Opening hours: M 09:00-16:00, Tu-Th. 08:00-16:00, F 09:00-15:00

Disclaimer

Please note that although we have tried our best to provide you with up-to-date and correct information, we cannot be held responsible for errors and changes. Note that the times listed above were last checked on **22.05.2025**.

There are a plethora of eating places off campus. Please see the conference website for other suggestions and maps.

GEM Coordination Team

Google map of Bochum with above sites and more

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FOR 2812
CONSTRUCTING SCENARIOS OF THE PAST

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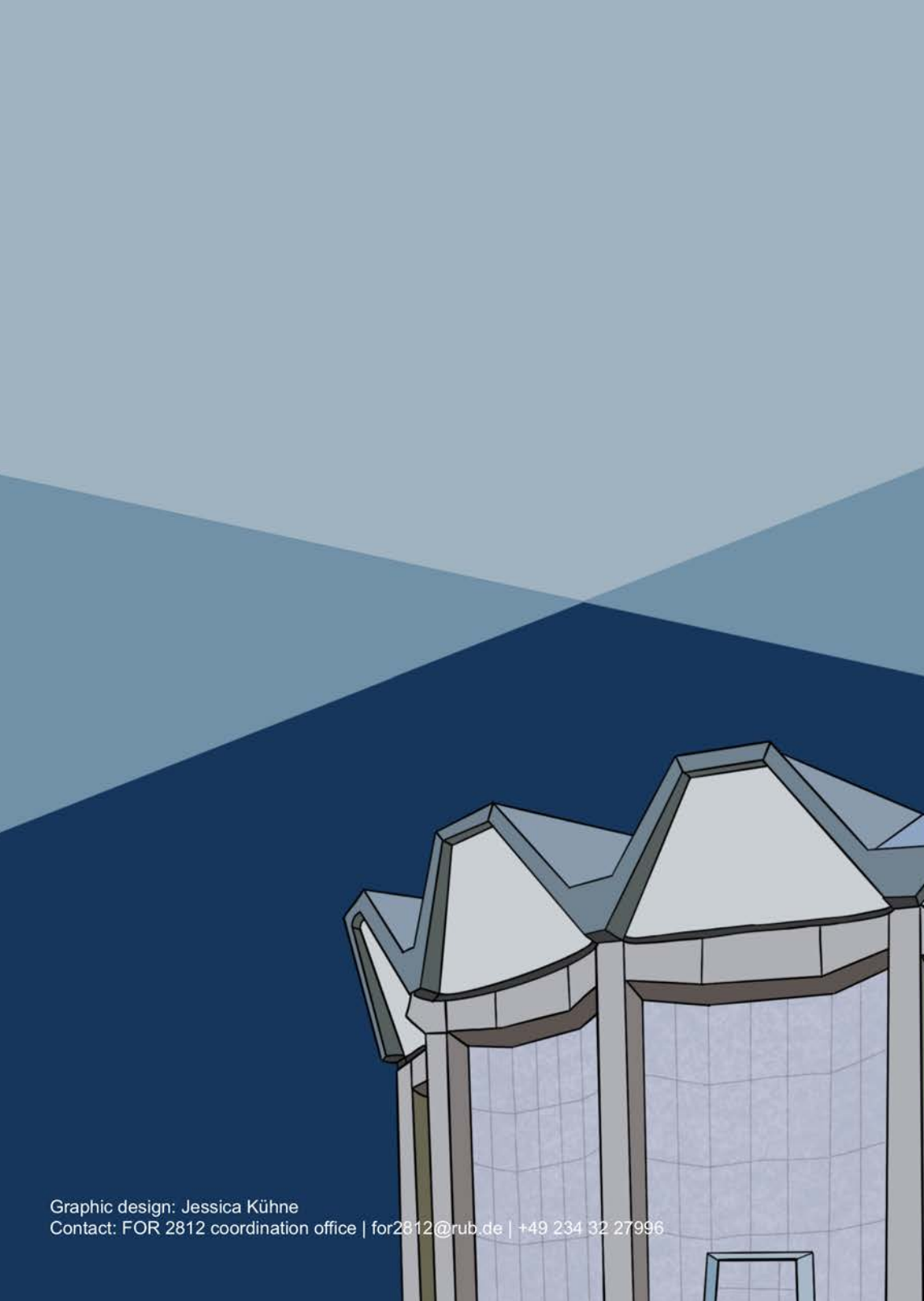

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